



NASA PATENT ABSTRACTS BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

JULY 1987

(NASA-SP-7039 (31)) NASA PATENT ABSTRACTS
BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY.
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NASA

PATENT
ABSTRACTS
BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

Annotated references to NASA-owned inventions covered by U.S. patents and applications for patent that were announced in *Scientific and Technical Aerospace Reports (STAR)* between January 1987 and June 1987.



Scientific and Technical Information Office

National Aeronautics and Space Administration

Washington, DC

1987

This document is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, price code A03

INTRODUCTION

Several thousand inventions result each year from the aeronautical and space research supported by the National Aeronautics and Space Administration. The inventions having important use in government programs or significant commercial potential are usually patented by NASA. These inventions cover practically all fields of technology and include many that have useful and valuable commercial application.

NASA inventions best serve the interests of the United States when their benefits are available to the public. In many instances, the granting of nonexclusive or exclusive licenses for the practice of these inventions may assist in the accomplishment of this objective. This bibliography is published as a service to companies, firms, and individuals seeking new, licensable products for the commercial market.

The *NASA Patent Abstracts Bibliography (NASA PAB)* is a semiannual NASA publication containing comprehensive abstracts and indexes of NASA-owned inventions covered by U.S. patents and applications for patent. The citations included in *NASA PAB* were originally published in NASA's *Scientific and Technical Aerospace Reports (STAR)* and cover *STAR* announcements made since May 1969.

For the convenience of the user, each issue of *NASA PAB* has a separately bound Abstract Section (Section 1) and Index Section (Section 2). Although each Abstract Section covers only the indicated six-month period, the Index Section is cumulative covering all NASA-owned inventions announced in *STAR* since 1969. Thus a complete set of *NASA PAB* would consist of the Abstract Sections of Issue 04 (January 1974) and Issue 12 (January 1978) and the Abstract Section for all subsequent issues and the Index Section for the most recent issue.

The 85 citations published in this issue of the Abstract Section cover the period January 1987 through June 1987. The Index Section references over 4600 citations covering the period May 1969 through June 1987.

ABSTRACT SECTION (SECTION 1)

This *PAB* issue incorporates the 1987 *STAR* category revisions which include 10 major subdivisions divided into 76 specific categories and one general category/division. (See Table of Contents for the scope note of each category under which are grouped appropriate NASA inventions.) This new scheme was devised in 1975 and revised in 1987 in lieu of the 34 category divisions which were utilized in *PAB* supplements (01) through (06) covering *STAR* abstracts from May 1969 through January 1974. Each entry in the Abstract Section consists of a *STAR* citation accompanied by an abstract and a key illustration taken from the patent or application for patent drawing. Entries are arranged in subject category in order of the ascending NASA Accession Number originally assigned to *STAR* to the invention. The range of NASA Accession Numbers within each issue is printed on the inside front cover.

Abstract Citation Data Elements: Each of the abstract citations has several data elements useful for identification and indexing purposes, as follows:

- NASA Accession Number
- NASA Case Number
- Inventor's Name
- Title of Invention
- U.S. Patent Application Serial Number
- U.S. Patent Number (for issued patents only)
- U.S. Patent Office Classification Number(s)
(for issued patents only)

These data elements are identified in the Typical Citation and Abstract and in the indexes.

INDEX SECTION (SECTION 2)

The Index Section is divided into five indexes. These indexes are cross-indexed and are used to locate a single invention or groups of inventions.

Subject Index: Lists all inventions according to appropriate alphabetized technical term and indicates the related NASA Case Number, the Subject Category Number, and the Accession Number.

Inventor Index: Lists all inventions according to alphabetized names of inventors and indicates the related NASA Case Number, the Subject Category Number, and the Accession Number.

Source Index: Lists all inventions according to alphabetized source of invention (i.e., name of contractor or government installation where invention was made) and indicates the related NASA Case Number, the Subject Category Number, and the Accession Number.

Number Index: Lists inventions in order of ascending (1) NASA Case Number, (2) U.S. Patent Application Serial Number, (3) U.S. Patent Classification Number, and (4) U.S. Patent Number and indicates the related Subject Category Number and the Accession Number.

Accession Number Index: Lists all inventions in order of ascending Accession Number and indicates the related Subject Category Number, the NASA Case Number, the U.S. Patent Application Serial Number, the U.S. Patent Classification Number, and the U.S. Patent Number.

HOW TO USE THIS PUBLICATION TO IDENTIFY NASA INVENTIONS

To identify one or more NASA inventions within a specific technical field or subject, several techniques are possible with the flexibility incorporated into the *NASA PAB*.

(1) *Using Subject Category:* To identify all NASA inventions in any one of the subject categories in this issue of *NASA PAB*, select the desired Subject Category in the Abstract Section (Section 1) and find the inventions abstracted thereunder.

(2) *Using Subject Index:* To identify all NASA inventions listed under a desired technical subject index term, (A) turn to the cumulative Subject Index in the Index Section and find the invention(s) listed under the desired technical subject term. (B) Note the indicated Accession Number and the Subject Category Number. (C) Using the indicated Accession Number, turn to the inside front cover of the Index Section to determine which issue of the Abstract Section includes the Accession Number desired. (D) To find the abstract of the particular invention in the issue of the Abstract Section selected, (i) use the Subject Category Number to locate the Subject Category and (ii) use the Accession Number to locate the desired invention within the Subject Category listing.

(3) *Using Patent Classification Index:* To identify all inventions covered by issued NASA patents (does not include applications for patent) within a desired Patent Classification, (A) turn to the Patent Classification Number in the Number Index of Section 2 and find the associated invention(s), and (B) follow the instructions outlined in (2)(B), and (D) above.

TYPICAL CITATION AND ABSTRACT

ON MICROFICHE

NASA SPONSORED

ACCESSION NUMBER → N87-15253*# National Aeronautics and Space Administration.
Ames Research Center, Moffett Field, Calif.

CORPORATE SOURCE

TITLE → **WEIGHTLESSNESS SIMULATION SYSTEM AND PROCESS**
Patent Application

INVENTORS → HUBERT C. VYKUKAL, inventor (to NASA) 29 Oct. 1986 14 p

NASA CASE NUMBER → (NASA-CASE-ARC-11646-1; NAS 1.71:ARC-11646-1;

US-PATENT-APPL-SN-924398) Avail: NTIS HC A02/MF A01

PRICE CODE

US PATENT APPLICATIONS
SERIAL NUMBER

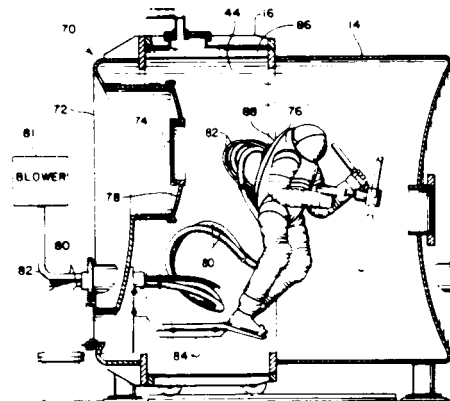
COSATI CODE

CSCL 14B
A weightlessness simulator has a chamber and a suit in the chamber. O-rings and valves hermetically seal the chamber. A vacuum pump connected to the chamber establishes a pressure in the chamber less than atmospheric pressure. A water supply tank and water supply line supply a body of water to the chamber as a result of partial vacuum created in the chamber. In use, an astronaut enters the pressure suit through a port, which remains open to ambient atmosphere, thus supplying air to the astronaut during use. The pressure less than atmospheric pressure in the chamber is chosen so that the pressure differential from the inside to the outside of the suit corresponds to the pressure differential with the suit in outer space.

NASA

AVAILABILITY SOURCE

ABSTRACT



KEY ILLUSTRATION

TABLE OF CONTENTS

Section 1 • Abstracts

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) · N.A.

02 AERODYNAMICS 1

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

03 AIR TRANSPORTATION AND SAFETY N.A.

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION N.A.

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Space Communications, Spacecraft Communications, Command and Tracking* and *32 Communications and Radar*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 2

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles see *85 Urban Technology and Transportation*.

06 AIRCRAFT INSTRUMENTATION N.A.

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER 2

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08 AIRCRAFT STABILITY AND CONTROL N.A.

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

For related information see also *05 Aircraft Design, Testing and Performance*.

09 RESEARCH AND SUPPORT FACILITIES (AIR) 3

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

ASTRONAUTICS

Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; space communications, spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*

12 ASTRONAUTICS (GENERAL) N.A.

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS N.A.

Includes powered and free-flight trajectories; and orbital and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) N.A.

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air)*.

15 LAUNCH VEHICLES AND SPACE VEHICLES N.A.

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles.

For related information see also *20 Spacecraft Propulsion and Power*.

16 SPACE TRANSPORTATION N.A.

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques.

For related information see also *03 Air Transportation and Safety* and *18 Spacecraft Design, Testing and Performance*. For space suits see *54 Man/System Technology and Life Support*.

17 SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING 3

Includes telemetry; space communications networks; astronaut navigation and guidance; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 4

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance*, *39 Structural Mechanics*, and *16 Space Transportation*.

19 SPACECRAFT INSTRUMENTATION N.A.

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 6

Includes main propulsion systems and components, e.g. rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion and Power*, *28 Propellants and Fuels*, *44 Energy Production and Conversion*, and *15 Launch Vehicles and Space Vehicles*.

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

23 CHEMISTRY AND MATERIALS (GENERAL) 7

24 COMPOSITE MATERIALS 8

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

For ceramic materials see *27 Nonmetallic Materials*.

25 INORGANIC AND PHYSICAL CHEMISTRY 9

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

26 METALLIC MATERIALS 10

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 11

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

For composite materials see *24 Composite Materials*.

28 PROPELLANTS AND FUELS N.A.

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.

29 MATERIALS PROCESSING 12

Includes space-based development of products and processes for commercial application.

For biological materials see *55 Space Biology*.

ENGINEERING

Includes engineering (general); communications and radar; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.

For related information see also *Physics*.

31 ENGINEERING (GENERAL) 13

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

32 COMMUNICATIONS AND RADAR 14

Includes radar; land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Space Communications, Spacecraft Communications, Command and Tracking*. For search and rescue see *03 Air Transportation and Safety*, and *16 Space Transportation*.

33 ELECTRONICS AND ELECTRICAL ENGINEERING 15

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

34 FLUID MECHANICS AND HEAT TRANSFER 16

Includes boundary layers; hydrodynamics; fluidics; mass transfer and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

35 INSTRUMENTATION AND PHOTOGRAPHY 17

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation*.

36 LASERS AND MASERS 19

Includes parametric amplifiers.

For related information see also *76 Solid-State Physics*.

37 MECHANICAL ENGINEERING 19

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY N.A.

Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS N.A.

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

GEOSCIENCES

Includes geosciences (general); earth resources and remote sensing; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

For related information see also *Space Sciences*.

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES AND REMOTE SENSING N.A.

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

44 ENERGY PRODUCTION AND CONVERSION 22

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower.

For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.

45 ENVIRONMENT POLLUTION N.A.

Includes atmospheric, noise, thermal, and water pollution.

46 GEOPHYSICS N.A.

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

47 METEOROLOGY AND CLIMATOLOGY N.A.

Includes weather forecasting and modification.

48 OCEANOGRAPHY N.A.

Includes biological, dynamic, and physical oceanography; and marine resources.

For related information see also *43 Earth Resources and Remote Sensing*.

LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology.

51 LIFE SCIENCES (GENERAL) N.A.

52 AEROSPACE MEDICINE N.A.

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

53 BEHAVIORAL SCIENCES N.A.

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT N.A.

Includes human engineering; biotechnology; and space suits and protective clothing.

For related information see also *16 Space Transportation*.

55 SPACE BIOLOGY N.A.

Includes exobiology; planetary biology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) N.A.

60 COMPUTER OPERATIONS AND HARDWARE 23

Includes hardware for computer graphics, firmware, and data processing.

For components see *33 Electronics and Electrical Engineering*.

61 COMPUTER PROGRAMMING AND SOFTWARE N.A.

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

62 COMPUTER SYSTEMS 23

Includes computer networks and special application computer systems.

63 CYBERNETICS N.A.

Includes feedback and control theory, artificial intelligence, robotics and expert systems.

For related information see also *54 Man/System Technology and Life Support*.

64 NUMERICAL ANALYSIS N.A.

Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY N.A.

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS N.A.

Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS N.A.

Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

For related information see also *Engineering*.

70 PHYSICS (GENERAL) N.A.

For precision time and time interval (PTTI) see *35 Instrumentation and Photography*; for geophysics, astrophysics or solar physics see *46 Geophysics*, *90 Astrophysics*, or *92 Solar Physics*.

71 ACOUSTICS N.A.
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution*.

72 ATOMIC AND MOLECULAR PHYSICS N.A.
Includes atomic structure, electron properties, and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS N.A.
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation*.

74 OPTICS 24
Includes light phenomena and optical devices.
For lasers see *36 Lasers and Masers*.

75 PLASMA PHYSICS N.A.
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

76 SOLID-STATE PHYSICS 25
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 THERMODYNAMICS AND STATISTICAL PHYSICS N.A.
Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law, political science, and space policy; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) N.A.
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT N.A.
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE N.A.
Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography.
For computer documentation see *61 Computer Programming and Software*.

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW, POLITICAL SCIENCE AND SPACE POLICY N.A.
Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION N.A.
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY N.A.
Includes radio, gamma-ray, and infrared astronomy; and astrometry.

90 ASTROPHYSICS N.A.
Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.
For related information see also *75 Plasma Physics*.

91 LUNAR AND PLANETARY EXPLORATION N.A.
Includes planetology; and manned and unmanned flights.
For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

92 SOLAR PHYSICS N.A.
Includes solar activity, solar flares, solar radiation and sunspots.
For related information see *93 Space Radiation*.

93 SPACE RADIATION N.A.
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

Section 2 • Indexes

SUBJECT INDEX
INVENTOR INDEX
SOURCE INDEX
CONTRACT NUMBER INDEX
NUMBER INDEX
ACCESSION NUMBER INDEX



JULY 1987 (Supplement 32)

NASA Patent Abstracts Bibliography

A Semiannual Publication of the National Aeronautics and Space Administration

02

AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

N87-14282*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

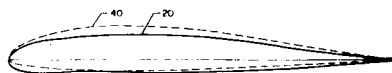
HIGH LIFT, LOW PITCHING MOMENT AIRFOILS Patent Application

K. W. NOONAN, inventor (to NASA) 5 Sep. 1986 30 p
(NASA-CASE-LAR-13215-1; NAS 1.71:LAR-13215-1;
US-PATENT-APPL-SN-904132) Avail: NTIS HC A03/MF A01
CSCL 51A

Two families of airfoil sections which can be used for helicopter/rotorcraft rotor blades or aircraft propellers of a particular shape are prepared. An airfoil of either family is one which could be produced by the combination of a camber line and a thickness distribution or a thickness distribution which is scaled from these. An airfoil of either family has a unique and improved aerodynamic performance. The airfoils of either family are intended for use as inboard sections of a helicopter rotor blade or an aircraft propeller. The novelty appears to reside in the specific shapes of the airfoil profiles which simultaneously permit high maximum lift coefficients at Mach numbers up to 0.50, low pitching moment coefficients about the quarter chord for lift coefficients from -0.2 to 1.0 at Mach numbers up to 0.63, and high drag divergence Mach numbers at lift coefficients from 0.0 to 0.30. NASA

COMPARISON OF RC(4)-10 AND VR-7

--- 20 RC(4)-10
--- 40 VR-7



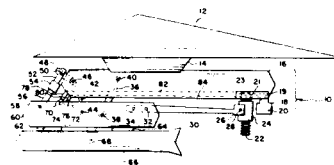
N87-16793* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

GEOMETRIES FOR ROUGHNESS SHAPES IN LAMINAR FLOW Patent

BRUCE J. HOLMES, inventor (to NASA), GLENN L. MARTIN, inventor (to NASA) (Kenton International, Inc., Hampton, Va.), CHRISTOPHER S. DOMACK, inventor (to NASA), CLIFFORD J. OBARA, inventor (to NASA), and AHMED A. HASSAN, inventor (to NASA) (Arizona State Univ., Tempe) 28 Oct. 1986 9 p
Filed 10 Nov. 1983 Supersedes N84-12092 (22 - 03, p 320)
(NASA-CASE-LAR-13255-1; US-PATENT-4,619,423;
US-PATENT-APPL-SN-550681; US-PATENT-CLASS-244-130;
US-PATENT-CLASS-244-35R; US-PATENT-CLASS-244-200;
US-PATENT-CLASS-244-204) Avail: US Patent and Trademark Office CSCL 01A

A passive interface mechanism between upper and lower skin structures, and a leading edge structure of a laminar flow airfoil is described. The interface mechanism takes many shapes. All are designed to be different than the sharp orthogonal arrangement prevalent in the prior art. The shapes of the interface structures are generally of two types: steps away from the centerline of the airfoil with a sloping surface directed toward the trailing edge and, the other design has a gap before the sloping surface. By properly shaping the step, the critical step height is increased by more than 50% over the orthogonal edged step.

Official Gazette of the US Patent and Trademark Office



N87-18535*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

METHOD FOR LAMINAR BOUNDARY LAYER TRANSITION VISUALIZATION IN FLIGHT Patent Application

BRUCE J. HOLMES, inventor (to NASA) and PETER D. GALL, inventor (to NASA) 13 Nov. 1986 9 p
(NASA-CASE-LAR-13554-1; NAS 1.71:LAR-13554-1;
US-PATENT-APPL-SN-929862) Avail: NTIS HC A02/MF A01
CSCL 01A

The invention relates to a method of visualizing laminar boundary layer transition in flight and is particularly useful in aerodynamic and hydrodynamic testing. Disclosed is a method of visualizing laminar to turbulent boundary layer transition, shock location, and laminar separation bubbles around a test surface. A liquid crystal coating is formulated using an unencapsulated liquid crystal operable in a temperature bandwidth compatible with the temperature environment around the test surface. The liquid crystal coating is applied to the test surface, which is preferably pretreated by painting with a flat, black paint to achieve a deep matte coating, after which the surface is subjected to a liquid or gas flow. Color change in the liquid crystal coating is produced in response to differences in relative shear stress within the boundary layer around the test surface. The novelty of this invention resides in the use of liquid crystals which are sensitive to shear stress to show aerodynamic phenomena such as a boundary layer transition, shock location and laminar separation bubbles around a test surface.

NASA

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

N87-14314* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

REMOTE PIVOT DECOUPLER PYLON: WING/STORE FLUTTER SUPPRESSOR Patent

J. M. HASSLER, JR., inventor (to NASA) (General Dynamics/Fort Worth, Tex.) 14 Oct. 1986 7 p Filed 10 Jan. 1985 Supersedes N85-19981 (22 - 19, p 2996)

(NASA-CASE-LAR-13173-1; US-PATENT-4,616,793;

US-PATENT-APPL-SN-690274; US-PATENT-CLASS-244-137-A;

US-PATENT-CLASS-244-17.27; US-PATENT-CLASS-244-118.1;

US-PATENT-CLASS-89-1.54; US-PATENT-CLASS-248-638)

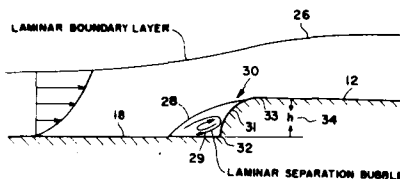
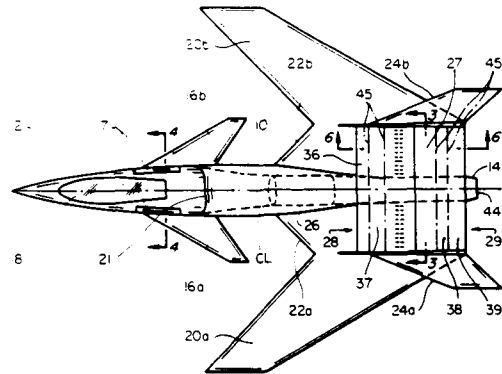
Avail: US Patent and Trademark Office CSCL 01C

A device for suspending a store from an aerodynamic support surface, such as an aircraft wing, and more specifically, for improving upon singlet pivot decoupler pylons by reducing both frequency of active store, alignment, and alignment system space and power requirements. Two links suspend a lower pylon/rack section and releasable attached store from an upper pylon section mounted under the wing. The links allow the lower pylon section to rotate in pitch about a remote pivot point. A leaf spring connected between the lower section and electrical alignment system servomechanism provides pitch alignment of the lower section/store combination. The servomechanism utilizes an electric servomotor to drive the gear train and reversibly move the leaf spring, thereby maintaining the pitch attitude of the store within acceptable limits. The damper strokes when the lower section rotates to damp large oscillations of store.

Official Gazette of the US Patent and Trademark Office

one embodiment the ejectors may be advantageously positioned spanwise on the wing while the ductwork is kept to a minimum.

NASA



07

AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

N87-18561*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

HIGH PERFORMANCE FORWARD SWEEP WING AIRCRAFT Patent Application

DAVID G. KOENIG, inventor (to NASA), KIYOSHI AOYAGI, inventor (to NASA), MICHAEL E. DUDLEY, inventor (to NASA), and SUSAN B. SCHMIDT, inventor (to NASA) 24 Nov. 1986 27 p (NASA-CASE-ARC-11636-1; US-PATENT-APPL-SN-933963; NAS 1.71:ARC-11636-1) Avail: NTIS HC A03/MF A01 CSCL 01C

A high performance aircraft capable of subsonic, transonic and supersonic speeds employs a forward swept wing planform and at least one first-and-second-solution ejector located on the inboard section of the wing. A high degree of flow control on the inboard sections of the wing is achieved along with improved maneuverability and control of pitch, roll and yaw. Lift loss is delayed to higher angles of attack than in conventional aircraft. In

N87-16828* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

OVER-THE-WING PROPELLER Patent

JOSEPH L. JOHNSON, JR., inventor (to NASA) and E. RICHARD WHITE, inventor (to NASA) (Kentron International, Inc., Hampton, Va.) 16 Dec. 1986 9 p Continuation of US-Patent-App-SN-661478; dated 16 Oct. 1984, abandoned

(NASA-CASE-LAR-13134-2; US-PATENT-4,629,147;

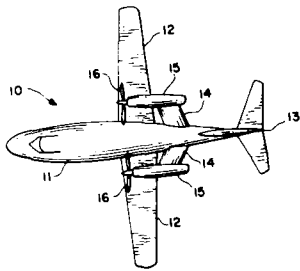
US-PATENT-APPL-SN-846462; US-PATENT-CLASS-244-55;

US-PATENT-CLASS-244-130) Avail: US Patent and Trademark Office CSCL 21E

This invention is an aircraft with a system for increasing the lift drag ratio over a broad range of operating conditions. The system positions the engines and nacelles over the wing in such a position that gains in propeller efficiency is achieved simultaneously with increases in wing lift and a reduction in wing drag. Adverse structural and torsional effects on the wings are avoided by fuselage mounted pylons which attach to the upper portion of the fuselage aft of the wings. Similarly, pylon-wing interference is eliminated by moving the pylons to the fuselage. Further gains are achieved by locating the pylon surface area aft of the aircraft center of gravity, thereby augmenting both directional and longitudinal stability. This augmentation has the further effect of reducing the size, weight and drag of empennage components.

The combination of design changes results in improved cruise performance and increased climb performance while reducing fuel consumption and drag and weight penalties.

Official Gazette of the US Patent and Trademark Office



09

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands.

N87-14355* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

DOUBLE WINDOW VIEWING CHAMBER ASSEMBLY Patent

V. W. KELLER, inventor (to NASA), R. B. OWEN, inventor (to NASA), B. R. ELKINS, inventor (to NASA), and W. T. WHITE, inventor (to NASA) 21 Oct. 1986 6 p Filed 2 May 1985

Supersedes N85-28951 (23 - 18, p 3063)

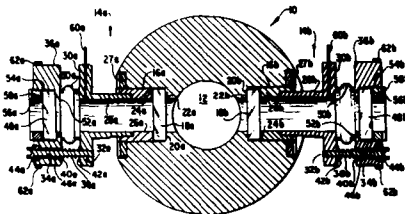
(NASA-CASE-MFS-28057-1; US-PATENT-4,618,215;

US-PATENT-APPL-SN-729766; US-PATENT-CLASS-350-319)

Avail: US Patent and Trademark Office CSCL 14B

A viewing chamber which permits observation of a sample retained therein includes a pair of double window assemblies mounted in opposed openings in the walls thereof so that a light beam can directly enter and exit from the chamber. A flexible mounting arrangement for the outer windows of the window assemblies enables the windows to be brought into proper alignment. An electrical heating arrangement prevents fogging of the outer windows whereas desiccated air in the volume between the outer and inner windows prevents fogging of the latter.

Official Gazette of the US Patent and Trademark Office



14

GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

N87-15253* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

WEIGHTLESSNESS SIMULATION SYSTEM AND PROCESS Patent Application

HUBERT C. VYKUKAL, inventor (to NASA) 29 Oct. 1986 14 p

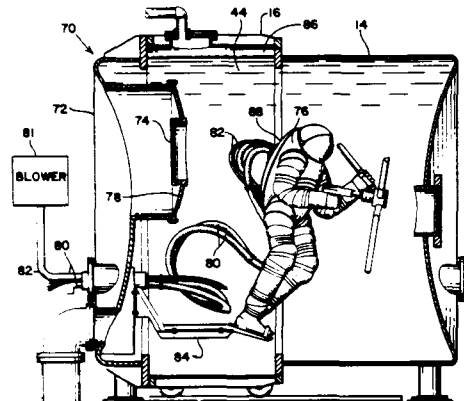
(NASA-CASE-ARC-11646-1; NAS 1.71:ARC-11646-1;

US-PATENT-APPL-SN-924398) Avail: NTIS HC A02/MF A01

CSCL 14B

A weightlessness simulator has a chamber and a suit in the chamber. O-rings and valves hermetically seal the chamber. A vacuum pump connected to the chamber establishes a pressure in the chamber less than atmospheric pressure. A water supply tank and water supply line supply a body of water to the chamber as a result of partial vacuum created in the chamber. In use, an astronaut enters the pressure suit through a port, which remains open to ambient atmosphere, thus supplying air to the astronaut during use. The pressure less than atmospheric pressure in the chamber is chosen so that the pressure differential from the inside to the outside of the suit corresponds to the pressure differential with the suit in outer space.

NASA



17

SPACE COMM., SPACECRAFT COMM., COMMAND & TRACKING

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout.

N87-16863* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

SINGLE FREQUENCY MULTITRANSMITTER TELEMETRY Patent

VICTOR A. CARRENO, inventor (to NASA) 23 Dec. 1986 11 p

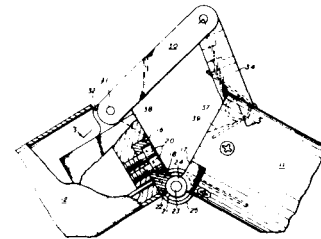
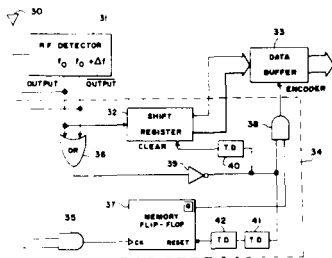
Filed 28 Feb. 1983 Supersedes N83-20995 (21 - 11, p 1652)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

(NASA-CASE-LAR-13006-1; US-PATENT-4,631,538;
US-PATENT-APPL-SN-470113; US-PATENT-CLASS-340-870.18;
US-PATENT-CLASS-340-825.5; US-PATENT-CLASS-371-63;
US-PATENT-CLASS-375-88) Avail: US Patent and Trademark
Office CSCL 09F

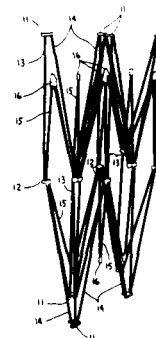
The invention relates to a single frequency multitransmitter telemetry system that will deliver a substantial amount of data at low cost. The invention consists essentially of a plurality of sensor transmitter units at different locations, with individual signal conditioning and logic, which send sampled data signals to a single receiver. The transmitters operate independently on the same frequency in a frequency shift keying modulation system and are not synchronized to the receiver. The problem of reception of data from more than one transmitter simultaneously is solved by discarding the data - when there is overlap of data from two or more transmitters, the data is discarded and when there is no overlap the data is retained. The invention utilizes a unique overlap detection technique to determine if data should be retained or discarded. When data is received from a transmitter, it goes into a shift register.

Official Gazette of the US Patent and Trademark Office



N87-14413* National Aeronautics and Space Administration.
Langley Research Center, Hampton, Va.
**SYNCHRONOUSLY DEPLOYABLE DOUBLE FOLD BEAM AND
PLANAR TRUSS STRUCTURE Patent Application**
M. D. RHODES, inventor (to NASA) and J. M. HEDGEPEETH,
inventor (to NASA) 22 Aug. 1986 14 p
(NASA-CASE-LAR-13490-1; NAS 1.71:LAR-13490-1;
US-PATENT-APPL-SN-899683) Avail: NTIS HC A02/MF A01
CSCL 84G

A deployable structure that synchronously deploys in both length and width is disclosed which is suitable for use as a structural component for orbiting space stations or large satellites. The structure is designed with maximum packing efficiency so that large structures may be collapsed and transported in the cargo bay of the Space Shuttle. The synchronous deployment feature allows the structure to be easily deployed in space by two astronauts, without a complex deployment mechanism. The structure is made up of interconnected structural units, each generally in the shape of a parallelepiped. The structural units are constructed of structural members connected with hinged and fixed connections at connection nodes in each corner of the parallelepiped. Diagonal members along each face of the parallelepiped provide structural rigidity and are equipped with mid-length, self-locking hinges to allow the structure to collapse. The structure is designed so that all hinged connections may be made with simple clevis-type hinges requiring only a single degree of freedom, and each hinge pin is located along the centerline of its structural member for increased strength and stiffness. NASA



18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

N87-14373* National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.
FOLDABLE SELF-ERECTING JOINT Patent
T. E. PELISCHEK, inventor (to NASA) 7 Oct. 1986 8 p Filed
9 Mar. 1984 Supersedes N84-32424 (22 - 22, p 3542)
(NASA-CASE-MSC-20635-1; US-PATENT-4,615,637;
US-PATENT-APPL-SN-588039; US-PATENT-CLASS-403-85;
US-PATENT-CLASS-403-102; US-PATENT-CLASS-403-119;
US-PATENT-CLASS-403-146; US-PATENT-CLASS-403-163;
US-PATENT-CLASS-16-294; US-PATENT-CLASS-16-370) Avail:
US Patent and Trademark Office CSCL 22B

The invention relates to a foldable self erecting joint which may be used to deploy the tetratruss frame of the proposed shuttle launched triangular space station. The frame must be folded into the payload bay of the space shuttle orbiter. To deploy the frame the tubes are automatically unfolded and once in position should remain safely. A pair of hinged, tubular members in which the hinging is located at corresponding portions of the members are used. The opposite edge portions are connected by spring-based

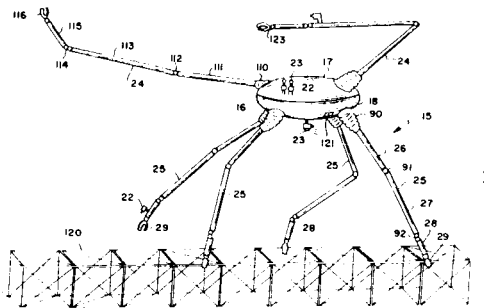
N87-15259*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

SPACE SPIDER CRANE Patent Application

IAN O. MACCONOCHIE, inventor (to NASA), JACK E. PENNINGTON, inventor (to NASA), CHARLES F. BRYAN, JR., inventor (to NASA), MARTIN M. MIKULAS, JR., inventor (to NASA), and REBECCA L. KINKEAD, inventor (to NASA) 30 Sep. 1986 18 p

(NASA-CASE-LAR-13411-15B; NAS 1.71:LAR-13411-1; US-PATENT-APPL-SN-913432) Avail: NTIS HC A02/MF A01 CSCL 84G

A space spider crane for the movement, placement, and/or assembly of various components on or in the vicinity of a space structure is described. As permanent space structures are utilized by the space program, a means will be required to transport cargo and perform various repair tasks. A space spider crane comprising a small central body with attached manipulators and legs fulfills this requirement. The manipulators may be equipped with constant pressure gripping end effectors or tools to accomplish various repair tasks. The legs are also equipped with constant pressure gripping end effectors to grip the space structure. Control of the space spider crane may be achieved either by computer software or a remotely situated human operator, who maintains visual contact via television cameras mounted on the space spider crane. One possible walking program consists of a parallel motion walking program whereby the small central body alternatively leans forward and backward relative to end effectors. NASA



N87-15260*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

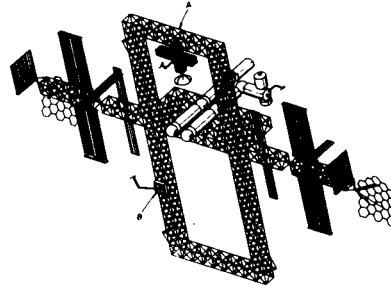
MOBILE REMOTE MANIPULATOR SYSTEM FOR A TETRAHEDRAL TRUSS Patent Application

CLARENCE J. WESSELSKI, inventor (to NASA) and WILLIAM C. SCHNEIDER, inventor (to NASA) 5 Sep. 1986 25 p

(NASA-CASE-MSC-20985-1; NAS 1.71:MSC-20985-1; US-PATENT-APPL-SN-904134) Avail: NTIS HC A02/MF A01 CSCL 22B

The mobile remote manipulator system (MRMS) was initially developed for transit about the trusses of the delta space station; however, it can be utilized just as easily for transit about the trusses of the dual keel station. The MRMS is comprised of a mobile platform B having a rail system formed of transversely disposed T-shaped tracks, which engage with guide pins located at the nodes of the trusses. The guide pins form a grid and the tracks are so designed as to permit travel in either of two orthogonal directions. For travel the MRMS is provided with retractable, reversible chain drive systems, which selectively engage sprockets on the guide pins for either longitudinal or transverse travel. The MRMS is also provided with direction changing means at the

intersection of the track systems to change from longitudinal to transverse travel. The MRMS provides a near-uniform traversing velocity with minimal dynamic loading on the system. NASA



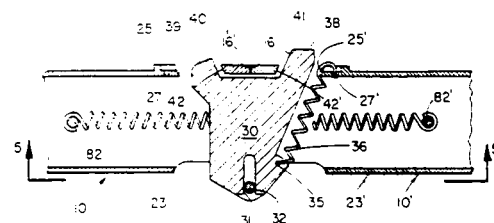
N87-18595*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

LOCKING HINGE Patent Application

CLARENCE J. WESSELSKI, inventor (to NASA) 29 Oct. 1986 16 p

(NASA-CASE-MSC-21056-1; NAS 1.71:MSC-21056-1; US-PATENT-APPL-SN-924397) Avail: NTIS HC A02/MF A01 CSCL 22B

The space station configuration currently being studied utilizes structures which require struts to be hinged in the middle in stowed configuration and locked into place in the deployed configuration. Since there are hundreds of hinges involved, it is necessary that they have simple, positive locking features with a minimum of joint looseness or slack. The instant invention comprises two similar housings hinged together with a spring loaded locking member which assists in making the lock as well as breaking it. The instant invention comprises a bracket hinge and bracket members with a spring biased and movable locking member. The locking or latch member has ear parts received in locking openings where wedging surfaces on the ear parts cooperate with complimentary surfaces on the bracket members for bringing the bracket members into a tight end-to-end alignment when the bracket members are in an extended position. When the locking member is moved to an unlocking position, pivoting of the hinge about a pivot pin automatically places the locking member to retain the locking member in an unlocked position. In pivoting the hinge from an extended position to a folded position, longitudinal spring members are placed under tension over annular rollers so that the spring tension in a folded position assists in return of the hinge from a folded position to an extended position. Novelty lies in the creation of a locking hinge which allows compact storage and easy assembly of structural members having a minimal number of parts. NASA



18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

N87-18596*# National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.

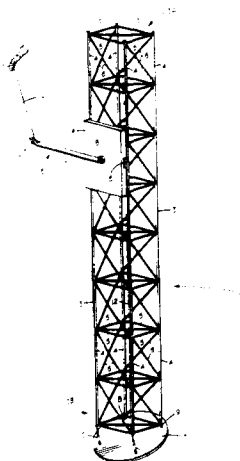
SPACE STATION ERECTABLE MANIPULATOR PLACEMENT SYSTEM Patent Application

MARGARET E. GRIMALDI, inventor (to NASA) 13 Nov. 1986
13 p

(NASA-CASE-MSC-21096-1; NAS 1.71:MSC-21096-1;
US-PATENT-APPL-SN-929865) Avail: NTIS HC A02/MF A01
CSCL 22B

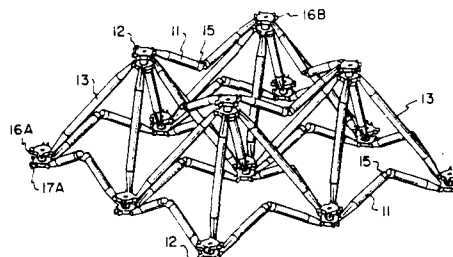
A habitable space station has been proposed for low Earth orbit, to be constructed from components which will be separately carried up from the Earth and thereafter assembled. A suitable manipulating system having extraordinary manipulative capability is required. The invention is an erectable manipulator placement system for use on a space station and comprising an elongate, lattice-like boom having guide tracks attached thereto, a carriage-like assembly pivotally mounted on and extending from said dolly. The system further includes a turntable base pivotally interconnected with the proximal end of the boom and positioned either on a part of a transferring vehicle, or on another payload component being carried by said transferring vehicle, or on the space station. Novelty resides in the use of a turntable base having a hinged boom with a dolly translatable therealong to carry the arm-like assembly, thus providing an additional 3 degrees of freedom to the arm.

NASA



Also, the pallet can serve as a splint with gridded plates; as instrument mounting bases; and as a roadbed for a Mobile Service Center (MSC). The novelty resides in providing closely spaced attachment points for mounting small components to the space station beams with widely spaced attachment points. The foldable expandable pallet removes the constraint that the main structure must have closely spaced node points for attachment purposes.

Author



20

SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

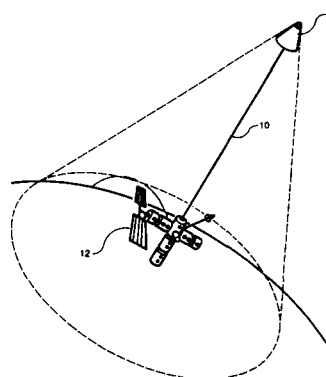
N87-10174*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

COAXIAL TUBE TETHER/TRANSMISSION LINE FOR MANNED NUCLEAR SPACE POWER Patent Application

D. J. BENTS, inventor (to NASA) 18 Aug. 1986 15 p
(NASA-CASE-LEW-14338-1; US-PATENT-APPL-SN-897239; NAS 1.71:LEW-14338-1) Avail: NTIS HC A02/MF A01 CSCL 10B

A spacecraft comprising a platform, a power system and a power transmission line adapted to transmitting high voltage electrical power in a space environment is disclosed. The transmission power line tethers the suborbiting platform to the power system located in a superorbital position relative to the platform.

NASA



N87-18597*# National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.

EXPANDABLE PALLET FOR SPACE STATION INTERFACE ATTACHMENTS Patent Application

CLARENCE J. WESSELSKI, inventor (to NASA) 13 Nov. 1986
18 p

(NASA-CASE-MSC-21117-1; NAS 1.71:MSC-21117-1;
US-PATENT-APPL-SN-929875) Avail: NTIS HC A02/MF A01
CSCL 22B

The present invention is directed to a foldable expandable pallet having a basic square configuration. Each pallet is comprised of a plurality of struts joined together by node point fittings to make a rigid structure. The struts have hinge fittings which are spring loaded to permit collapse of the module for stowage transport to a space station in the payload bay of the space shuttle, and deployment on orbit. Dimensions of the pallet are selected to provide convenient, closely spaced attachment points between the node points of the relatively widely spaced trusses of a space station platform. A pallet is attached to a truss at four points: one close fitting hole; two oversize holes, and a slot which allows for thermal expansion/contraction and for manufacturing tolerances. Applications of the pallet include its use to attach rotary joints.

23 CHEMISTRY AND MATERIALS (GENERAL)

N87-14420* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

LOW LOSS INJECTOR FOR LIQUID PROPELLANT ROCKET ENGINES Patent

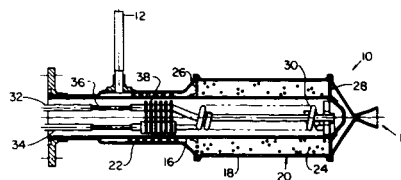
G. L. VONPRAGENAU, inventor (to NASA) 11 Nov. 1986 10 p (NASA-CASE-MFS-25989-1; US-PATENT-4,621,492; US-PATENT-APPL-SN-690273; US-PATENT-CLASS-60-258; US-PATENT-CLASS-60-746; US-PATENT-CLASS-239-132.5; US-PATENT-CLASS-239-425; US-PATENT-CLASS-239-403) Avail: US Patent and Trademark Office CSCL 21H

A low pressure loss injector element is disclosed for the main combustion chamber of a rocket engine which includes a lox post terminating in a cylindrical barrel. Received within the barrel is a lox plug which is threaded in the lox post and includes an interchangeable lox metering sieve which meters the lox into an annular lox passage. A second annular gas passage is coaxial with the annular lox passage. A cylindrical sleeve surrounds the annular gas passage and includes an interchangeable gas metering sieve having metering orifices through which a hot gas passes into the annular passage. The jets which emerge from the annular lox passage and annular gas passage intersect in a recessed area away from the combustion area. Thus, mixing and combustion stability are enhanced.

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in an annular chamber surrounding the cylindrical chamber. Propellant gas flows through the annular chamber and is heated by the heat exchanger material.

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23

CHEMISTRY AND MATERIALS (GENERAL)

N87-14432* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SUBSTITUTED 1,1,1-TRIARYL-2,2,2-TRIFLUOROETHANES AND PROCESSES FOR THEIR SYNTHESIS Patent Application

W. B. ALSTON, inventor (to NASA) and R. F. GRATZ, inventor (to NASA) 29 Oct. 1986 24 p (NASA-CASE-LEW-14345-1; NAS 1.71:LEW-14345-1; US-PATENT-APPL-SN-924474) Avail: NTIS HC A02/MF A01 CSCL 990

Synthetic procedures are described for tetraalkyls, tetraacids and dianhydrides substituted 1,1,1-triaryl-2,2,2-trifluoroethanes which comprises: (1) 1,1-bis(dialkylaryl)-1 aryl-2,2,2-trifluoroethane; (2) 1,1-bis(carboxyaryl)-1 aryl-2,2,2-trifluoroethane; or (3) cyclic dianhydride or diamine of 1,1-bis(dialkylaryl)-1 aryl-2,2,2-trifluoroethanes. The synthesis of (1) is accomplished by the condensation reaction of an aryltrifluoromethyl ketone with a dialkylaryl compound. The synthesis of (2) is accomplished by oxidation of (1). The synthesis dianhydride of (3) is accomplished by the conversion of (2) to its corresponding cyclic dianhydride. The synthesis of the diamine is accomplished by the similar reaction of an aryltrifluoromethyl ketone with aniline or alkyl substituted or disubstituted anilines. Also, other derivatives of the above are formed by nucleophilic displacement reactions.

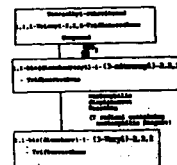
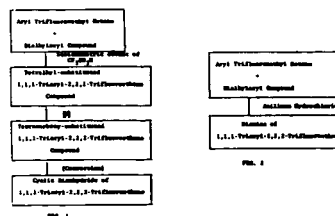
NASA

N87-16875* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HEAT EXCHANGER FOR ELECTROTHERMAL DEVICES Patent

RALPH J. ZAVESKY, inventor (to NASA), JAMES S. SOVEY, inventor (to NASA), MICHAEL J. MIRTICH, inventor (to NASA), CHARALAMPUS MARINOS, inventor (to NASA), and PAUL F. PENKO, inventor (to NASA) 2 Sep. 1986 7 p Filed 31 Jul. 1984 Supersedes N84-32425 (22 - 22, p 3542) (NASA-CASE-LEW-14037-1; US-PATENT-4,608,821; US-PATENT-APPL-SN-636463; US-PATENT-CLASS-60-203.1; US-PATENT-CLASS-219-275) Avail: US Patent and Trademark Office CSCL 21H

An improved electrothermal device is disclosed. An electrothermal thruster utilizes a generally cylindrical heat exchanger chamber to convert electricity to heat which raises the propellant temperature. A textured, high emissivity heat element radiatively transfers heat to the inner wall of this chamber that is ion beam morphologically controlled for high absorptivity. This, in turn, raises the temperature of a porous heat exchanger material



23 CHEMISTRY AND MATERIALS (GENERAL)

N87-14433*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NEW CONDENSATION POLYIMIDES CONTAINING 1,1,1-TRIARYL-2,2,2-TRIFLUOROETHANE STRUCTURES Patent Application

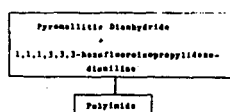
W. B. ALSTON and R. F. GRATZ, inventors (to NASA) 29 Oct. 1986 27 p

(NASA-CASE-LEW-14346-1; NAS 1.71:14346-1;

US-PATENT-APPL-SN-934470) Avail: NTIS HC A03/MF A01

CSCL 07A

The invention relates to a condensation polyimide containing a 1,1,1-triaryl-2,2,2-trifluoroethane structure and other related condensation polyimides. The process for their preparation, which comprises polymerization of a cyclic dianhydride with a diamine is also covered. NASA



N87-15275*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PREPARATION OF B-TRICHLOROBORAZINE Patent Application

SALVATORE R. RICCIETELLO, inventor (to NASA), MING-TA S. HSU, inventor (to NASA), and TIMOTHY S. CHEN, inventor (to NASA) 28 Aug. 1986 11 p Sponsored by NASA

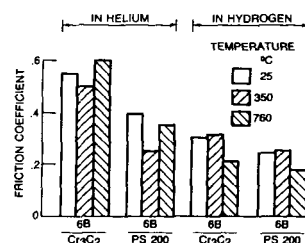
(NASA-CASE-ARC-11643-1-SB; NAS 1.71:ARC-11643-1-SB;

US-PATENT-APPL-SN-901496) Avail: NTIS HC A02/MF A01

CSCL 07A

A method of preparing B-trichloroborazine is disclosed. Generally, the method includes the combination of gaseous boron trichloride and excess gaseous ammonia at ambient temperature or below, under anhydrous conditions in a polar organic solvent, heating the reaction mixture to 100 to 140 C for a time effective to produce the trichloroborazine, cooling and removing the ammonium chloride formed, removing the solvent at ambient pressure, and recovering the B-trichloroborazine. A preferred solvent in the process is anhydrous toluene. Yields of B-trichloroborazine of about 40 percent are obtained. This process provides both a laboratory and larger-scale preparation from gaseous components. B-trichloroborazine is useful in a number of chemical reactions including the formation of high temperature inorganic polymers. NASA

spectrum from cryogenic temperature to about 900 C in a chemically reactive environment. The composites are comprised of silver, barium fluoride/calcium fluoride eutectic, and bonded chromium carbide. NASA



N87-14442*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

CERAMIC-CERAMIC SHELL TILE THERMAL PROTECTION SYSTEM AND METHOD THEREOF Patent Application

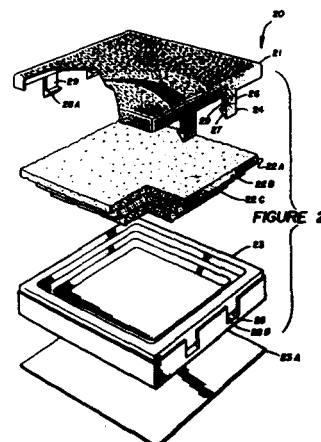
S. R. RICCIETELLO, inventor (to NASA), M. SMITH, inventor (to NASA), H. GOLDSTEIN, inventor (to NASA), and N. B. ZIMMERMAN, inventor (to NASA) 14 May 1986 31 p

(NASA-CASE-ARC-11641-1; NAS 1.71:ARC-11641-1;

US-PATENT-APPL-SN-862925) Avail: NTIS HC A03/MF A01

CSCL 11D

A ceramic reusable, externally applied composite thermal protection system (TPS) is proposed. The system functions by utilizing a ceramic/ceramic upper shell structure which effectively separates its primary functions as a thermal insulator and as a load carrier to transmit loads to the cold structure. The composite tile system also prevents impact damage to the atmospheric entry vehicle thermal protection system. The composite tile comprises a structurally strong upper ceramic/ceramic shell manufactured from ceramic fibers and ceramic matrix meeting the thermal and structural requirements of a tile used on a re-entry aerospace vehicle. In addition, a lightweight high temperature ceramic lower temperature base tile is used. The upper shell and lower tile are attached by means effective to withstand the extreme temperature (3000 to 3200 F) and stress conditions. The composite tile may include one or more layers of variable density rigid or flexible thermal insulation. The assembly of the overall tile is facilitated by two or more locking mechanisms on opposing sides of the overall tile assembly. The assembly may occur subsequent to the installation of the lower shell tile on the spacecraft structural skin. NASA



24

COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

N87-10179*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CARBIDE/FLUORIDE/SILVER SELF-LUBRICATING COMPOSITE Patent Application

H. E. SLINEY, inventor (to NASA) 5 May 1986 12 p

(NASA-CASE-LEW-14196-1; US-PATENT-APPL-SN-859688; NAS

1.71:LEW-14196-1) Avail: NTIS HC A02/MF A01 CSCL 11D

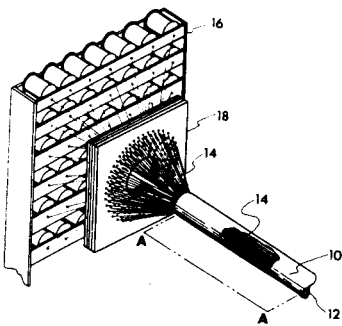
This invention relates to a self-lubricating, friction and wear reducing composite material for use over a wide temperature

N87-18613*# National Aeronautics and Space Administration.
Langley Research Center, Hampton, Va.

SEAMLESS METAL-CLAD FIBER-REINFORCED ORGANIC MATRIX COMPOSITE STRUCTURES AND PROCESS FOR THEIR MANUFACTURE Patent Application

RAYMOND M. BLUCK, inventor (to NASA) (Lockheed Missiles and Space Co., Sunnyvale, Calif.), HAROLD G. BUSH, inventor (to NASA), and ROBERT R. JOHNSON, inventor (to NASA) 21 Oct. 1986 10 p
(NASA-CASE-LAR-13562-1; NAS 1.71:LAR-13562-1;
US-PATENT-APPL-SN-921572) Avail: NTIS HC A02/MF A01
CSSL 11D

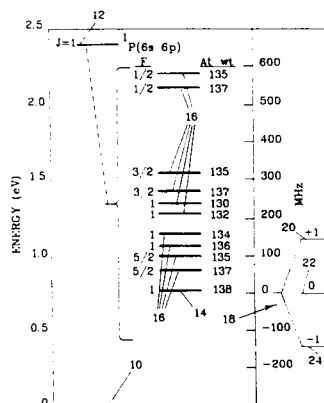
The invention relates to seamless metal clad filament reinforced resin matrix composite tubular structures and processes for their manufacture and is particularly useful in the construction of spacecraft and space structures. Metal clad composites make a significant advancement over those composite systems being used for both spacecraft and aircraft; however, the material consolidation and tooling advances necessary to realize the potential of such metal clad composites had not hitherto been achieved. Accordingly, it is an object of this invention to provide an efficient method of producing seamless metal clad composite structures. A metallic outer sleeve is provided which is capable of enveloping a hollow metallic inner member having continuous reinforcing fibers attached to the distal end thereof. Inner member is then introduced into outer sleeve until inner member is completely enveloped by outer sleeve. A liquid matrix material is then injected into the space between inner member and outer sleeve. A pressurized heat transfer medium is flowed through the inside of inner member, thereby forming a fiber reinforced matrix composite material. The wall thicknesses of both inner member and outer sleeve are then reduced to the appropriate size by chemical etching, to adjust the thermal expansion coefficient of the metal-clad composite structure to the desired value. The novelty of this invention resides in the development of a efficient method of producing seamless metal clad fiber reinforced organic matrix composite structures. NASA



NAS 1.71:NPO-16907-1-CU) Avail: NTIS HC A02/MF A01
CSCL 20H

High selectivity and economy have been attained by the apparatus of the present invention for producing and separating a stream of a selected isotope from an atomic beam containing a mixture of isotopes comprising means for producing an atomic beam containing the isotope of interest and other isotopes. Means are provided for producing a magnetic field traversing the path of the atomic beam of an intensity sufficient to broaden the energy domain of the various individual magnetic sublevels of the isotope of interest and having the atomic beam passing therethrough. A laser beam is produced of a frequency selected to maximize the activation of only individual magnetic sublevels of the isotope of interest within the portion of its broadened energy domain most removed from other isotopes within the beam. The laser beam is directed so as to strike the atomic beam within the magnetic field and traverse the path of the atomic beam whereby only the isotope of interest is activated by the laser beam. The apparatus further includes means for producing a collimated and high intensity beam of electrons of narrow energy distribution within the magnetic field which is aimed so as to strike the atomic beam while the atomic beam is simultaneously struck by the laser beam and at an energy level selected to ionize the activated isotope of interest but not ground state species included therein. Finally, deflection means are disposed in the usual manner so as to have the atomic beam pass therethrough after being struck by the electron beam so that the ionized isotope is deflected from the remainder of the beam to form a separate stream composed only of the isotope of interest.

NASA



25

INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

N87-18625*# National Aeronautics and Space Administration.
Pasadena Office, Calif.

ISOTOPE SEPARATION USING TUNED LASER AND ELECTRON BEAM Patent Application

SANDOR TRAJMAR, inventor (to NASA) 13 Nov. 1986 24 p
(Contract NAS7-918)
(NASA-CASE-NPO-16907-1-CU; US-PATENT-APPL-SN-930217;

N87-18626*# National Aeronautics and Space Administration.
Langley Research Center, Hampton, Va.

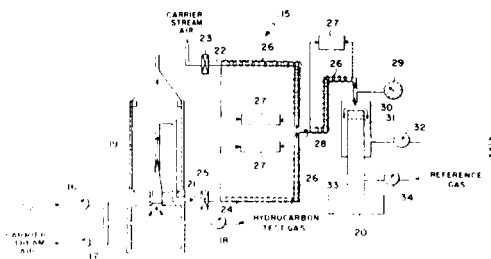
METHOD AND DEVICE FOR DETERMINING HEATS OF COMBUSTION OF GASEOUS HYDROCARBONS Patent Application

JAG J. SINGH, inventor (to NASA), DANNY R. SPRINKLE, inventor (to NASA), and RICHARD L. PUSTER, inventor (to NASA) 24
Nov. 1986 16 p
(NASA-CASE-LAR-13528-1; NAS 1.71:LAR-13528-1;
US-PATENT-APPL-SN-933962) Avail: NTIS HC A02/MF A01
CSCIL 21B

A method and device is provided for a quick, accurate and on-line determination of heats of combustion of gaseous hydrocarbons. First, the amount of oxygen in the carrier stream air is sensed by an oxygen sensing system. Second, three individual volumetric flow rates of oxygen, carrier stream air, and hydrocarbon test gas are introduced into a burner. The hydrocarbon test gas is fed into the burner at a volumetric flow rate, \dot{V}_h , measured by a

25 INORGANIC AND PHYSICAL CHEMISTRY

flowmeter. Third, the amount of oxygen in the resulting combustion products is sensed by an oxygen sensing system. Fourth, the volumetric flow rate of oxygen is adjusted until the amount of oxygen in the combustion product equals the amount of oxygen previously sensed in the carrier stream air. This equalizing volumetric flow rate, m , is measured by the flowmeter. The heat of combustion of the hydrocarbon test gas is then determined from the ratio m/n .
NASA

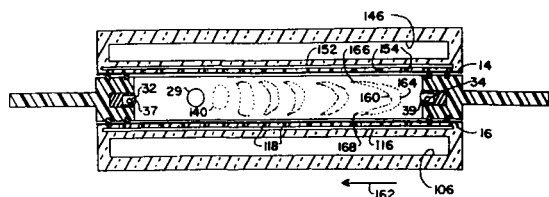


N87-18627*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

MOVING WALL, CONTINUOUS FLOW ELECTROPHORESIS APPARATUS Patent Application

PERCY H. RHODES, inventor (to NASA) 5 Sep. 1986 17 p
(NASA-CASE-MFS-28142-1; NAS 1.71:MFS-28142-1;
US-PATENT-APPL-SN-904128) Avail: NTIS HC A02/MF A01
CSCL 07D

This invention relates generally to electrophoresis devices and more particularly to a moving wall, continuous flow device wherein an electrophoresis chamber is angularly positionable with respect to the direction of moving belt walls. A frame having an electrophoresis chamber is rotatably supported between two synchronously driven belt walls. This allows the chamber to be angularly positionable with respect to the direction of belt travel, which compensates for electroosmotic flow within the electrophoresis chamber. Injection of a buffer solution via an opening and a homogenous sample stream via another opening is performed at end of a chamber, and collection of buffer and the fractionated species particles is done by a conventional collection array at an opposite end of the chamber. Belts are driven at a rate which exactly matches the flow of buffer and sample through the chamber, which entrains the buffer to behave as a rigid electrophoretic medium, eliminating flow distortions (Poiseuille effect). Additionally, belt material for each belt is stored at one end of the device and is taken up by drive reels at an opposite end. The novelty of this invention particularly lies in the electrophoresis chamber being angularly positionable between two moving belt walls in order to compensate for electroosmotic flow. Additionally, new belt material is continuously exposed within the chamber, minimizing flow distortions due to contamination of the belt material by the sample.
NASA



26

METALLIC MATERIALS

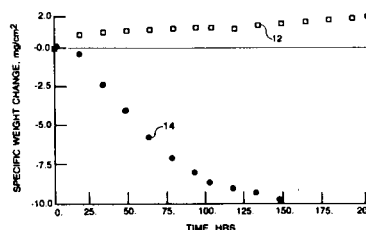
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N87-10192*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CASTABLE HOT CORROSION RESISTANT ALLOY Patent Application

C. A. BARRETT, inventor (to NASA) and W. H. HOLT, inventor (to NASA) 30 Jul. 1986 8 p
(NASA-CASE-LEW-14134-1; US-PATENT-APPL-SN-890584; NAS 1.71:LEW-14134-1) Avail: NTIS HC A02/MF A01 CSCL 11F

About ten weight percent nickel is added to a Fe-base ferritic alloy to improve the high temperature castability and crack resistance while about 0.2 weight percent zirconium is added for improved high temperature cyclic oxidation and corrosion resistance. The basic material is a high temperature FeCrAl heater alloy, and the addition provides a material suitable for burner rig nozzles.
NASA



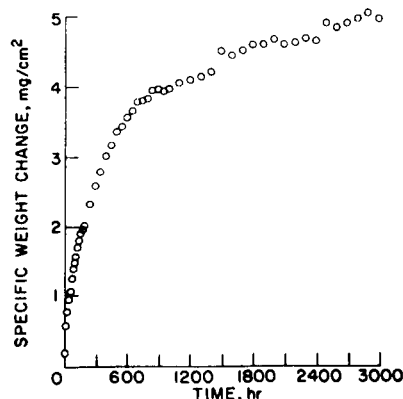
N87-14482* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NICKEL BASE COATING ALLOY Patent

C. A. BARRETT, inventor (to NASA) and C. E. LOWELL, inventor (to NASA) 9 Sep. 1986 4 p Filed 23 Mar. 1983 Supersedes N83-24639 (21 - 14, p 2189)
(NASA-CASE-LEW-13834-1; US-PATENT-4,610,736;
US-PATENT-APPL-SN-478131; US-PATENT-CLASS-148-429;
US-PATENT-CLASS-420-460) Avail: US Patent and Trademark Office CSCL 11F

Zirconium is added to a Ni-30 Al (beta) intermetallic alloy in the range of 0.05 w/o to 0.25 w/o. This addition is made during melting or by using metal powders. The addition of zirconium improves the cyclic oxidation resistance of the alloys at temperatures above 1100 C.

Official Gazette of the US Patent and Trademark Office



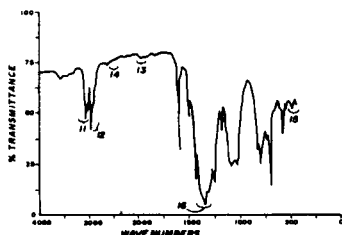
27

NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N87-10205*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BORON-CONTAINING ORGANOSILANE POLYMERS AND CERAMIC MATERIALS THEREOF Patent Application
 S. R. RICCITIELLO, inventor (to NASA), M. T. S. HSU, inventor (to NASA) (Chem. H. C.) Research and Service Corp., San Jose, Calif., and T. S. CHAN, inventor (to NASA) 30 Jul. 1986 20 p (NASA-CASE-ARC-11649-1-SB; US-PATENT-APPL-SN-890577; NAS 1.71:ARC-11649-1-SB) Avail: NTIS HC A02/MF A01 CSCL 11B

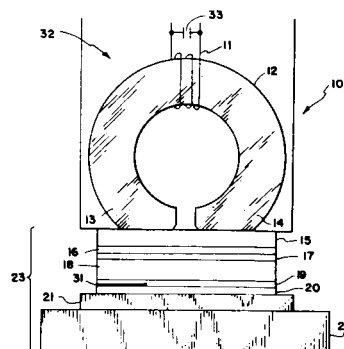
The present invention relates to organic silicon-boron polymers which upon pyrolysis produce high-temperature ceramic materials. More particularly, it relates to the polyorganoborosilanes containing -Si-B- bonds which generate high-temperature ceramic materials (e.g., SiC, SiB₄, SiB₆, B₃C) upon thermal degradation. The processes for preparing these organic silicon-boron polymer precursors are also a part of this invention. M.G.



N87-10206*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A METHOD OF ESTIMATING THE MOLECULAR WEIGHT OF POLYMERIC MATERIALS Patent Application
 J. R. TYERYAR, inventor (to NASA), B. J. JENSEN, inventor (to NASA), and R. L. FOX, inventor (to NASA) 22 Aug. 1986 14 p (NASA-CASE-LAR-13212-1; US-PATENT-APPL-SN-898986; NAS 1.71:LAR-13212-1) Avail: NTIS HC A02/MF A01 CSCL 11B

A rapid method to estimate the molecular weight of polymers by forming a film from the polymeric material and subjecting the newly formed film to a crease test to estimate molecular weight is disclosed. An induction heating apparatus, essentially as disclosed in U.S. Patent No. 4,521,659, is mounted in a hydraulic press. The polymeric material to be tested is placed between two sheets of high-temperature release film, which is placed between two conductive plates, which is placed between two layers of insulation to form a sandwich specimen fixture. Heat is applied rapidly to the fixture by the induction heating apparatus until a temperature above the melting point of the polymer is reached, while pressure is applied simultaneously by means of the hydraulic press. The temperature of the fixture is held constant for between one and five minutes, after which the fixture is cooled to a temperature below the glass transition temperature of the polymer, and the pressure is then released. The newly formed film is then

subjected to a crease test. If the film is creaseable and not brittle, the polymer is determined to be of sufficiently high molecular weight. NASA



N87-14515* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE 5-(4-ETHYNYLOPHENOXY) ISOPHTHALIC CHLORIDE Patent

P. M. HERGENROTHER and B. J. JENSEN, inventors (to NASA) 11 Nov. 1986 7 p Division of US-Patent-4,587,312, US-Patent-AppI-SN-613139, filed 23 May 1984 (NASA-CASE-LAR-13316-2; US-PATENT-4,622,182; US-PATENT-APPL-SN-760791; US-PATENT-CLASS-260-544-P) Avail: US Patent and Trademark Office CSCL 07A

Sulfone-ester polymers containing pendent ethynyl groups and a direct and multistep process for preparing them are disclosed. The multistep process involves the conversion of a pendent bromo group to the ethynyl group while the direct route involves reacting hydroxy-terminated sulfone oligomer or polymers with a stoichiometric amount of 5-(4-ethynylphenoxy) isophthaloyl chloride. The 5-(4-ethynylphenoxy) isophthaloyl chloride and the process for preparing it are also disclosed.

Official Gazette of the US Patent and Trademark Office

N87-14516* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ACETYLENE (ETHYNYL) TERMINATED POLYIMIDE SILOXANE AND PROCESS FOR PREPARATION THEREOF Patent

T. L. STCLAIR and S. MAUDGAL, inventors (to NASA) (National Academy of Sciences - National Research Council, Washington, D. C.) 25 Nov. 1986 6 p Filed 30 Sep. 1985 Supersedes N86-21685 (24 - 12, p 1927)

(NASA-CASE-LAR-13318-1; US-PATENT-4,624,888; US-PATENT-APPL-SN-781813; US-PATENT-CLASS-428-262; US-PATENT-CLASS-428-447; US-PATENT-CLASS-528-26) Avail: US Patent and Trademark Office CSCL 11B

Siloxane containing addition polyimides having improved physical property characteristics of flexibility, drape, tack, and toughness and the process for preparing and utilizing the same are disclosed. The novelty of this invention appears to reside in the composition and process of preparing addition type polyimides useful as structural adhesives as well as composite matrix materials and the process of preparing the same.

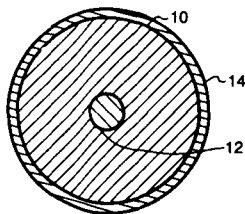
Official Gazette of the US Patent and Trademark Office

N87-14517* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FIBER REINFORCED CERAMIC MATERIAL Patent Application
R. T. BHATT, inventor (to NASA) 16 Jul. 1986 14 p
(NASA-CASE-LEW-14392-1; NAS 1.71:LEW-14392-1;
US-PATENT-APPL-SN-886149) Avail: NTIS HC A02/MF A01
CSCL 710

Alternate layers of mats of specially coated SiC fibers and silicon monotapes are hot pressed in two stages to form a fiber reinforced ceramic material. In the first stage a die is heated to about 600 C in a vacuum furnace and maintained at this temperature for about one-half hour to remove fugitive binder. In the second stage the die temperature is raised to about 1000 C and the layers are pressed at between 35 MPa and 138 MPa. The resulting preform is placed in a reactor tube where a nitriding gas is flowed past the preform at 1100 C to 1400 C to nitride the same.

NASA



N87-15304* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PROCESS FOR CURING BISMALEIMIDE RESINS Patent

JOHN A. PARKER, inventor (to NASA), ALVIN H. HEIMBUCH, inventor (to NASA), MING-TA S. HSU, inventor (to NASA) (San Jose State Univ., Calif.), and TIMOTHY S. CHEN, inventor (to NASA) (San Jose State Univ., Calif.) 21 Oct. 1986 10 p
Division of US-Patent-4,526,925; US-Patent-AppI-SN-553339, filed 18 Nov. 1983

(NASA-CASE-ARC-11429-4CU; US-PATENT-4,618,652;
US-PATENT-APPL-SN-725686; US-PATENT-CLASS-525-282)
Avail: US Patent and Trademark Office CSCL 07B

This invention relates to vinyl pyridine group containing compounds and oligomers, their advantageous copolymerization with bismaleimide resins, and the formation of reinforced composites based on these copolymers. When vinyl pyridines including vinyl stilbazole materials and vinyl styrylpyridine oligomer materials are admixed with bismaleimides and cured to form copolymers the cure temperatures of the copolymers are substantially below the cure temperatures of the bismaleimides alone. Official Gazette of the US Patent and Trademark Office

N87-16907* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ETHYNYL TERMINATED ESTER OLIGOMERS AND POLYMERS THEREFROM Patent

PAUL M. HERGENROTHER, inventor (to NASA) and STEPHEN J. HAVENS, inventor (to NASA) (Kentron International, Inc., Hampton, Va.) 20 Jan. 1987 7 p

(NASA-CASE-LAR-13118-2; US-PATENT-4,638,083;
US-PATENT-APPL-SN-760797; US-PATENT-CLASS-560-104)
Avail: US Patent and Trademark Office CSCL 11B

A new class of ethynyl-terminated oligomers and the process for preparing same are disclosed. Upon the application of heat, with or without a catalyst, the ethynyl groups react to provide crosslinking and chain extension to increase the polymer use temperature and improve the polymer solvent resistance. These improved polyesters are potentially useful in packaging, magnetic

tapes, capacitors, industrial belting, protective coatings, structural adhesives and composite matrices.

Official Gazette of the US Patent and Trademark Office

N87-16908* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

VINYL STILBAZOLES Patent

JOHN A. PARKER, inventor (to NASA), ALVIN H. HEIMBUCH, inventor (to NASA), MING-TA S. HSU, inventor (to NASA) (San Jose State Univ., Calif.), and TIMOTHY S. CHEN, inventor (to NASA) 2 Dec. 1986 9 p Division of US-Patent-4,526,925, US-Patent-AppI-SN-553339, dated 18 Nov. 1983
(NASA-CASE-ARC-11429-3CU; US-PATENT-4,626,593;
US-PATENT-APPL-SN-725725; US-PATENT-CLASS-546-339;
US-PATENT-CLASS-546-346; US-PATENT-CLASS-546-350)
Avail: US Patent and Trademark Office CSCL 11B

Vinyl pyridines including vinyl stilbazole materials and vinyl styrylpyridine oligomer materials are disclosed. These vinylpyridines form copolymers with bismaleimides which copolymers have good fire retardancy and decreased brittleness. The cure temperatures of the copolymers are substantially below the cure temperatures of the bismaleimides alone. Reinforced composites made from the cured copolymers are disclosed as well.

Official Gazette of the US Patent and Trademark Office

N87-16909* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FIRE AND HEAT RESISTANT LAMINATING RESINS BASED ON MALEIMIDO SUBSTITUTED AROMATIC CYCLOTRIPHOSPHAZENE POLYMER Patent

DEVENDRA KUMAR, inventor (to NASA) (National Academy of Sciences - National Research Council, Washington, D. C.), GEORGE M. FOHLEN, inventor (to NASA), and JOHN A. PARKER, inventor (to NASA) 6 Jan. 1987 20 p Division of US-Patent-4,550,177; US-Patent-AppI-SN-599126, dated 14 Apr. 1984

(NASA-CASE-ARC-11428-2; US-PATENT-4,634,759;
US-PATENT-APPL-SN-760374; US-PATENT-CLASS-528-321;
US-PATENT-CLASS-528-168; US-PATENT-CLASS-528-322;
US-PATENT-CLASS-428-421; US-PATENT-CLASS-428-473.5;
US-PATENT-CLASS-428-500; US-PATENT-CLASS-428-704)
Avail: US Patent and Trademark Office CSCL 11B

4-Aminophenoxy cyclotriphosphazenes are reacted with maleic anhydride to produce maleamic acids which are converted to the maleimides. The maleimides are polymerized. By selection of starting materials (e.g., hexakis amino or trisaminophenoxy triphenoxy cyclotriphosphazenes), selection of molar proportions of reactants, use of mixtures of anhydrides and use of dianhydrides as bridging groups a variety of maleimides and polymers are produced. The polymers have high limiting oxygen indices, high char yields and other useful heat and fire resistant properties making them useful as, for example, impregnants of fabrics.

Official Gazette of the US Patent and Trademark Office

29

MATERIALS PROCESSING

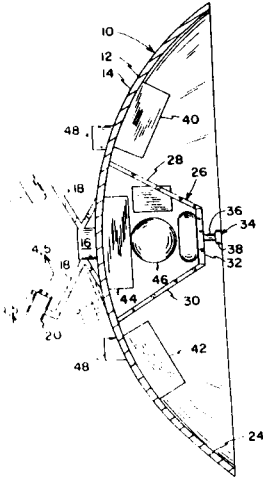
Includes space-based development of products and processes for commercial applications.

N87-18679* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SPACE ULTRA-VACUUM FACILITY AND METHOD OF OPERATION Patent Application

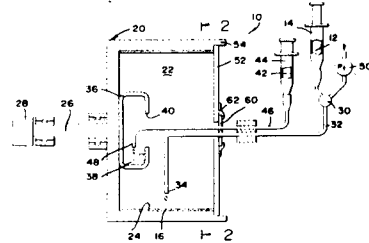
ROBERT J. NAUMANN, inventor (to NASA) 26 Sep. 1986 17 p
(NASA-CASE-MFS-28139-1; NAS 1.71:MFS-28139-1;
US-PATENT-APPL-SN-911851) Avail: NTIS HC A02/MF A01
CSCL 22A

A wake shield facility providing an ultrahigh vacuum level for space processing is described. The facility is in the shape of a truncated, hollow hemispherical section, one side of the shield convex and the other concave. The shield surface is preferably made of material that has low out-gassing characteristics such as stainless steel. A material sample supporting fixture in the form of a carousel is disposed on the convex side of the shield at its apex. Movable arms, also on the convex side, are connected by the shield in proximity to the carousel, the arms supporting processing fixtures, and providing for movement of the fixtures to predetermined locations required for producing interactions with material samples. For MBE processes a vapor jet projects a stream of vaporized material onto a sample surface. The fixtures are oriented to face the surface of the sample being processed when in their extended position, and when not in use they are retractable to a storage position. The concave side of the shield has a support structure including metal struts connected to the shield, extending radially inward. The struts are joined to an end plate disposed parallel to the outer edge of the shield. This system eliminates outgassing contamination. NASA



and other applications, which enables the particles to be cast at a high packing density in a tape of uniform thickness. A slurry contains the particles, a binder, and a solvent, and is cast against the inside walls of a rotating chamber. Prior to spraying the slurry against the chamber walls, a solvent is applied to a container. The solvent evaporates to saturate the chamber with solvent vapor. Only then is the slurry cast. As a result, the slurry remains fluid long enough to spread evenly over the casting surface formed by the chamber, and for the slurry particles to become densely packed. Only then is the chamber vented to remove solvent, so the slurry can dry. The major novel feature is applying solvent vapor to a rotating chamber before casting slurry against the chamber walls.

NASA



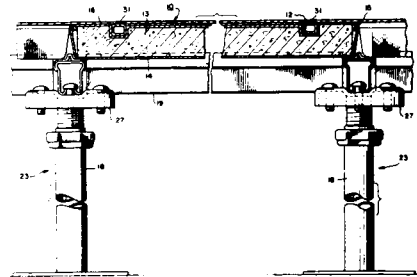
N87-16918* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

ELEVATED WATERPROOF ACCESS FLOOR SYSTEM AND METHOD OF MAKING THE SAME Patent

MARC M. COHEN, inventor (to NASA) 20 Jan. 1987 9 p
Filed 1 Jun. 1983 Supersedes N83-28281 (21 - 17, p 2736)
(NASA-CASE-ARC-11363-1; US-PATENT-4,637,181;
US-PATENT-APPL-SN-500046; US-PATENT-CLASS-52-126.5;
US-PATENT-CLASS-52-309.15; US-PATENT-CLASS-52-391;
US-PATENT-CLASS-52-511; US-PATENT-CLASS-52-814) Avail:
US Patent and Trademark Office CSCL 13B

An elevated waterproof access floor system having subfloor channels or compartments for power lines, gas lines or the like is adapted such that it can be opened and subsequently resealed without destroying the waterproofing and without destroying its aesthetic appearance. A multiplicity of tiles are supported on a support grid, and a flooring sheet is supported on the tiles. Attachment means are provided to prevent lateral but not vertical movement of the flooring sheet with respect to the tiles so that the flooring sheet can be lifted off the tiles, but when the flooring sheet is supported on the tiles, no lateral slipping will occur. The flooring sheet is made of a heat resealable material, so that it can be cut away in sections, and the tiles therebelow lifted off, to provide access to subfloor compartments.

Official Gazette of the US Patent and Trademark Office



31

ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

N87-15327*# National Aeronautics and Space Administration. Pasadena Office, Calif.

HIGH INTENSITY CASTING SYSTEM Patent Application

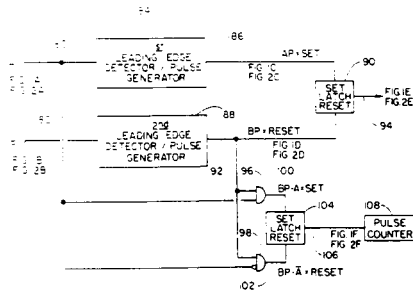
EARL R. COLLINS, JR., inventor (to NASA) 21 Oct. 1986 11 p
(Contract NAS7-918)
(NASA-CASE-NPO-16901-1-CU; NAS 1.71:NPO-16901-1-CU;
US-PATENT-APPL-SN-921574) Avail: NTIS HC A02/MF A01
CSCL 13H

A system is provided for casting thin sheets (or tapes) of particles bound together, that are used for oxygen membranes

14

and corresponding beams returning therefrom are detected. A digital difference circuit forms a pulse train from the Doppler shift frequencies of each beam pair having a repetition rate functionally related to the difference in magnitude of the shift frequencies. Pulses from the pulse train are counted as a function of time. Visual indications thereof on display are correlative to target position relative to beams.

NASA



33

ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

N87-10231*# National Aeronautics and Space Administration. Pasadena Office, Calif.

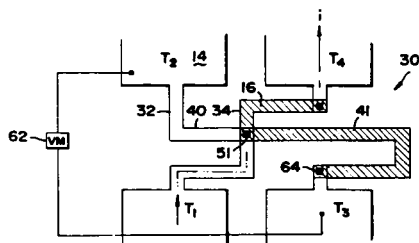
CROSS-CONTACT CHAIN Patent Application

U. LIENEWEG, inventor (to NASA) 26 Jun. 1986 16 p (Contract NAS7-918)

(NASA-CASE-NPO-16784-1; US-PATENT-APPL-SN-879757; NAS 1.71:NPO-16784-1) Avail: NTIS HC A02/MF A01 CSCL 09A

A system is provided for use with wafers that include multiple integrated circuits that include two conductive layers in contact at multiple interfaces. Contact chains are formed beside the integrated circuits, each contact chain formed of the same two layers as the circuits, in the form of conductive segments alternating between the upper and lower layers and with the ends of the segments connected in series through interfaces. A current source passes a current through the series-connected segments, by way of a pair of current tabs connected to opposite ends of the series of segments. While the current flows, voltage measurements are taken between each of a plurality of pairs of voltage tabs, the two tabs of each pair connected to opposite ends of an interface that lies along the series-connected segments. A plot of interface conductances on normal probability chart enables prediction of the yield of good integrated circuits from the wafer.

NASA



N87-14594* National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD OF EXAMINING MICROCIRCUIT PATTERNS Patent

S. F. SUSZKO, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena) 18 Nov. 1986 10 p Filed 13 Oct. 1983 Supersedes N85-20250 (23 - 11, p 1628) Sponsored by NASA

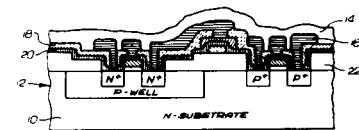
(NASA-CASE-NPO-16299-1; US-PATENT-4,623,255;

US-PATENT-APPL-SN-541526; US-PATENT-CLASS-356-389)

Avail: US Patent and Trademark Office CSCL 09C

Examination of microstructures of LSI and VLSI devices is facilitated by employing a method in which the device is photographed through a darkfield illumination optical microscope and the resulting negative subjected to inverse processing to form a positive on a photographic film. The film is then developed to form photographic prints or transparencies which clearly illustrate the structure of the device. The entire structure of a device may be examined by alternately photographing the device and selectively etching layers of the device in order to expose underlying layers.

Official Gazette of the US Patent and Trademark Office



N87-15413*# National Aeronautics and Space Administration. Pasadena Office, Calif.

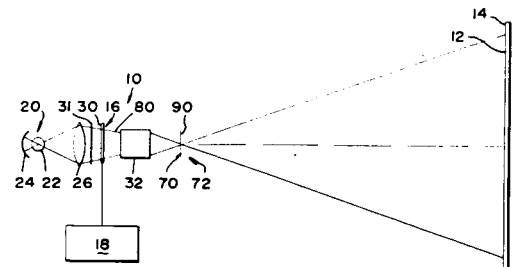
LARGE TV DISPLAY SYSTEM Patent Application

HUA-KUANG LIU, inventor (to NASA) 30 Sep. 1986 11 p (Contract NAS7-918)

(NASA-CASE-NPO-16932-1CU; NAS 1.71:NPO-16932-1; US-PATENT-APPL-SN-913433) Avail: NTIS HC A02/MF A01 CSCL 09C

A relatively small and low cost system is provided for projecting a large and bright television image onto a screen. A miniature liquid crystal array is driven by video circuitry to produce a pattern of transparencies in the array corresponding to a television image. Light is directed against the rear surface of the array to illuminate it, while a projection lens lies in front of the array to project the image of the array onto a large screen. Grid lines in the liquid crystal array are eliminated by a spacial filter which comprises a negative of the Fourier transform of the grid.

NASA



33 ELECTRONICS AND ELECTRICAL ENGINEERING

N87-15414*# National Aeronautics and Space Administration. Pasadena Office, Calif.

COAXIAL CABLE CONNECTOR Patent Application

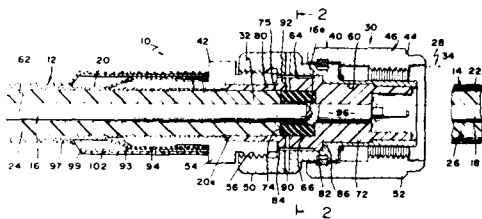
EDWARD CARO, inventor (to NASA) and WALTER J. BONAZZA, inventor (to NASA) 8 Sep. 1986 10 p

(Contract NAS7-918)

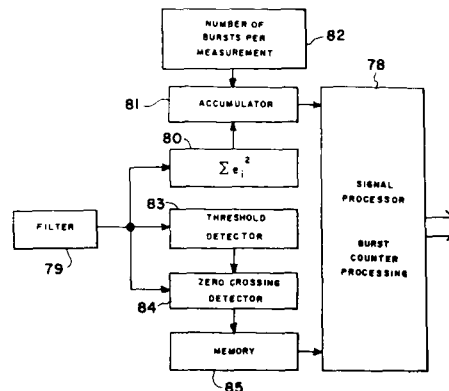
(NASA-CASE-NPO-16964-1CU; NAS 1.71:NPO-16764-1;

US-PATENT-APPL-SN-704513) Avail: NTIS HC A02/MF A01 CSCL 09C

A coaxial cable connector is provided, which resists radio frequency breakdown in coaxial cables used in the vacuum of outer space. The connector body surrounds an insulator which includes an easily compressible elastomeric portion. An insulated coaxial cable is prepared so its insulation projects beyond the outer conductor and compresses the elastomeric portion of the connector insulator. NASA



automatic gain circuit with amplifiers, the ADC, the shift registers and the digital filter circuitry for processing captured signal bursts. NASA



34

FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

N87-18778*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

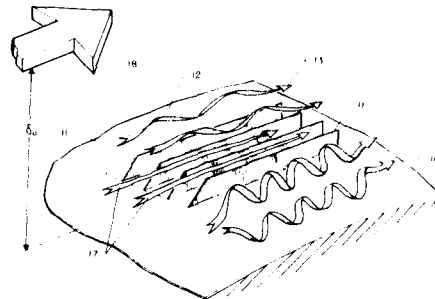
THIN-ELEMENT RIBLET SURFACE Patent Application

STEPHEN P. WILKINSON, inventor (to NASA) 21 Oct. 1986 13 p

(NASA-CASE-LAR-13553-1; NAS 1.71:LAR-13553-1;

US-PATENT-APPL-SN-921575) Avail: NTIS HC A02/MF A01 CSCL 20D

The thin-element riblet surface of this invention is a modification of the traditional smooth flow surfaces used in aerodynamic or hydrodynamic applications. This modification is made by adding an array of very thin elements projecting from an otherwise smooth, impervious surface and forming small, adjacent, rectangular channels on the surface which are aligned with the flow. When the riblets are closely spaced, the normal process of turbulence production takes place above the peaks of the riblets. When the riblets are widely spaced, vortices form within the channels in pairs with opposite rotations at each riblet. The vortex rotation is such that turbulence production is localized above the vortices. In either case, the area immediately above the surface remains relatively quiet. NASA



N87-18761*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FREQUENCY DOMAIN LASER VELOCIMETER SIGNAL Patent Application

JAMES F. MEYERS, inventor (to NASA), JOHN W. STROUGHTON, inventor (to NASA) (Old Dominion Univ., Norfolk, Va.), JAMES I. CLEMMONS, JR., inventor (to NASA), SHARAD V. KANETKAR, inventor (to NASA), and ANDREAS E. SAVAKIS, inventor (to NASA) 24 Nov. 1986 23 p

(NASA-CASE-LAR-13552-1-CU; NAS 1.71:LAR-13552-1-CU;

US-PATENT-APPL-SN-933941) Avail: NTIS HC A02/MF A01 CSCL 09C

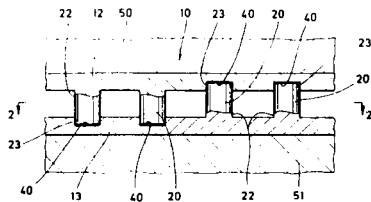
The invention is a signal processor for measuring the oscillating frequency contained in a laser velocimeter signal burst or bursts. The input to the signal processor is applied through a fixed gain amplifier to an amplifier that has an automatic gain control provided by automatic gain circuit. The output from amplifier 14 is converted to digital by a non-linear analog-to-digital converter (ADC). The output from ADC 16 is shifted into two shift registers with a register receiving the most significant bits (MSB) from the ADC and with register receiving the least significant bits (LSB) from the ADC. A signal integration circuit under the control of the bits shifted into and out of the MSB shifter register determines when a signal burst has been captured by the shift registers. When a signal burst has been captured the data in the shift registers is transferred and processed by a bank of digital filters and other circuitry to determine the frequency in the signal burst. The automatic gain circuit is under the control of the bits shifted into and out of both shift registers. The novel feature of the invention appears to lie in the overall combination of the signal integration circuit, the

N87-18779* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

HIGH EFFECTIVENESS CONTOUR MATCHING CONTACT HEAT EXCHANGER Patent Application

ROBERT L. BLAKELY, inventor (to NASA), GEORGE J. ROEBELEN, JR., inventor (to NASA), and ARTHUR K. DAVENPORT, inventor (to NASA) 19 Dec. 1986 11 p (NASA-CASE-MSC-20840-1; NAS 1.71:MSC-20840-1; US-PATENT-APPL-SN-943346) Avail: NTIS HC A02/MF A01 CSCL 20D

There is a need in the art for a heat exchanger design having a flexible core which provides contour matching capabilities, which compensates for manufacturing tolerance and distortion buildups, and which accordingly furnishes a relatively uniform thermal contact conductance between the core and external heat sources under essentially all operating conditions. The core of the heat exchanger comprises a top plate and a bottom plate, each having alternating rows of pins attached thereto. Each of the pins fits into corresponding tight-fitting recesses in the opposite plate. Thus, the pin and recess design allows the heat exchanger core to expand the contract to match the mating part contours without significantly affecting the flow distribution, since gaps of varying thickness are not created at the ends of pins by the thermal expansion and contraction of the plates. Novelty resides in the use of recesses for one end of the pins to maintain the pins in thermal contact with both plates despite the nonuniform distance between the plates. NASA



INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

N87-14669* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

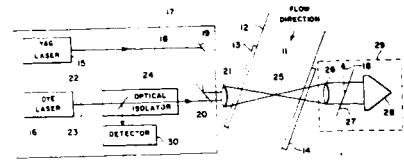
VIBRATION-FREE RAMAN DOPPLER VELOCIMETER Patent

R. J. EXTON, inventor (to NASA) 25 Nov. 1986 9 p Filed 25 Apr. 1985 Supersedes N85-29216 (23 - 18, p 3104) (NASA-CASE-LAR-13268-1; US-PATENT-4,624,561; US-PATENT-APPL-SN-727034; US-PATENT-CLASS-356-28.5; US-PATENT-CLASS-356-301) Avail: US Patent and Trademark Office CSCL 14B

A method and apparatus unaffected by vibrational environments for obtaining measurements using Raman Doppler Velocimetry is described. Two laser beams, a pump beam, and a probe beam, are focused by a lens to a point in a flow. A lens collimates the two beams. A beam splitter dumps the beam and the other beam is reflected by a corner cube back to the lens. The other lens then focuses the beam back to the point. The reflected beam and the backward and forward scattering at the point are detected

by a detector and processed by a boxcar averager. The lens and corner cube combination, called a retrometer, ensure that the measurements are unaffected by vibrations.

Official Gazette of the US Patent and Trademark Office



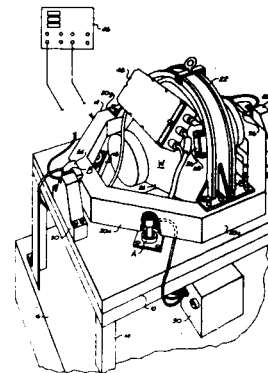
N87-14670* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

EMITTED VIBRATION MEASUREMENT DEVICE AND METHOD Patent

G. L. GISLER, inventor (to NASA) (Sperry Corp., Phoenix, Ariz.) 28 Oct. 1986 9 p Filed 3 Oct. 1984 Supersedes N85-20299 (23 - 11, p 1635) (NASA-CASE-MFS-25981-1; US-PATENT-4,619,142; US-PATENT-APPL-SN-657310; US-PATENT-CLASS-73-462; US-PATENT-CLASS-73-473; US-PATENT-CLASS-73-477) Avail: US Patent and Trademark Office CSCL 14B

This invention is directed to a method and apparatus for measuring emitted vibrational forces produced by a reaction wheel assembly due to imbalances, misalignment, bearing defects and the like. The apparatus includes a low mass carriage supported on a large mass base. The carriage is in the form of an octagonal frame having an opening which is adapted for receiving the reaction wheel assembly supported thereon by means of a mounting ring. The carriage is supported on the base by means of air bearings which support the carriage in a generally frictionless manner when supplied with compressed air from a source. A plurality of carriage brackets and a plurality of base blocks provided for physical coupling of the base and carriage. The sensing axes of the load cells are arranged generally parallel to the base and connected between the base and carriage such that all of the vibrational forces emitted by the reaction wheel assembly are effectively transmitted through the sensing axes of the load cells. In this manner, a highly reliable and accurate measurement of the vibrational forces of the reaction wheel assembly can be had. The output signals from the load cells are subjected to a dynamical analyzer which analyzes and identifies the rotor and spin bearing components which are causing the vibrational forces.

Official Gazette of the US Patent and Trademark Office



35 INSTRUMENTATION AND PHOTOGRAPHY

N87-14671* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

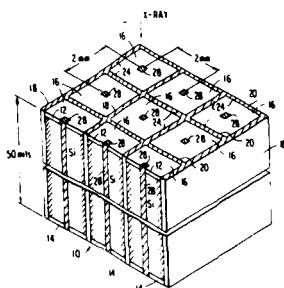
METHOD OF FABRICATING AN IMAGING X-RAY SPECTROMETER Patent

G. E. ALCORN, inventor (to NASA) and A. S. BURGESS, inventor (to NASA) 21 Oct. 1986 7 p Filed 18 Jun. 1985 Supersedes N86-20754 (24 - 11, p 1776)

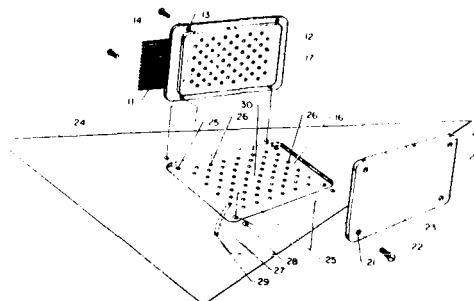
(NASA-CASE-GSC-12956-1; US-PATENT-4,618,380; US-PATENT-APPL-SN-745977; US-PATENT-CLASS-148-187; US-PATENT-CLASS-148-188; US-PATENT-CLASS-148-189; US-PATENT-CLASS-148-190; US-PATENT-CLASS-29-580; US-PATENT-CLASS-29-591) Avail: US Patent and Trademark Office CSCL 14B

A process for fabricating an X-ray spectrometer having imaging and energy resolution of X-ray sources is discussed. The spectrometer has an array of adjoining rectangularly shaped detector cells formed in a silicon body. The walls of the cells are created by laser drilling holes completely through the silicon body and diffusing n(+) phosphorous doping material therethrough. A thermally migrated aluminum electrode is formed centrally through each of the cells.

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involving numerous test sites while utilizing a minimum internal volume of the test structure. NASA



N87-14676*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

ACOUSTIC EMISSION FREQUENCY DISCRIMINATION Patent Application

F. E. SUGG, inventor (to NASA) (Rockwell International Corp., Thousand Oaks, Calif.) and L. J. GRAHAM 12 Jun. 1986 17 p Sponsored by NASA

(NASA-CASE-MSC-20467-1; NAS 1.71:MSC-20467-1; US-PATENT-APPL-SN-874319) Avail: NTIS HC A02/MF A01 CSCL 14B

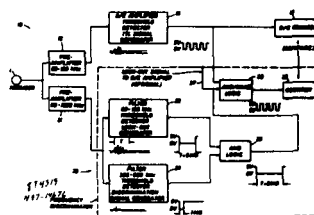
In acoustic emission nondestructive testing, broadband frequency noise is distinguished from narrow banded acoustic emission signals, wherein the latter are valid events indicative of structural flaws in the material being examined. This is accomplished by separating out those signals which contain frequency components both within and beyond (either above or below) the range of valid acoustic emission events. Application to acoustic emission monitoring during nondestructive bond verification and proof loading of undensified tiles on the space shuttle orbiter is considered. NASA

N87-14675*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DEVICE FOR QUICK CHANGEOVER BETWEEN WIND TUNNEL FORCE AND PRESSURE TESTING Patent Application

R. M. WOOD, inventor (to NASA) 28 Aug. 1986 10 p (NASA-CASE-LAR-13512-1; NAS 1.71:LAR-13512-1; US-PATENT-APPL-SN-901113) Avail: NTIS HC A02/MF A01 CSCL 82B

This device allows for expeditious and repeated changeovers between pressure and force testing and which uses a minimum internal volume of a wind tunnel test structure. A matrix configuration of holes is located on the outer surface of the structure. Pressure tubes lead through the internal cavity of the structure from test sites to this outer surface matrix configuration. A pressure tube connector with a corresponding matrix of holes is connected to the surface of the structure. Pressure tubes leading from remotely located transducers are joined to the connector, thus forming pressure passageways from the test sites to the transducers to allow for pressure testing. When force testing is required, the pressure tube connector is disconnected and a cover plate is connected. The cover plate seals the exposed internal pressure tubes. Also, the outer surface of the cover plate conforms to the exterior of the structure, providing the necessary smooth surface for force testing. If further pressure testing is required, the cover plate can be disconnected and the pressure tube connector reconnected. The novelty of this invention resides in the development of a device which allows for an expeditious changeover between wind tunnel force and pressure testing



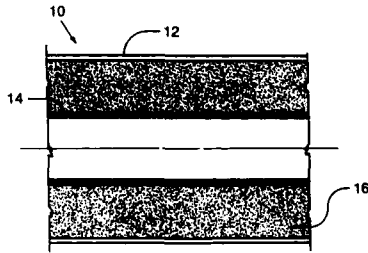
N87-15452*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

GAS PARTICLE RADIATOR Patent Application

DONALD L. CHUBB, inventor (to NASA) 9 Oct. 1986 8 p (NASA-CASE-LEW-14297-1; NAS 1.71:LEW-14297-1; US-PATENT-APPL-SN-917125) Avail: NTIS HC A02/MF A01 CSCL 82B

A gas particle radiator adapted to operate in a microgravity space environment having a transparent boundary which transmits

energy in the infrared spectrum, and a gas particle mixture that yields high absorption and emittances are described. NASA



36

LASERS AND MASERS

Includes parametric amplifiers.

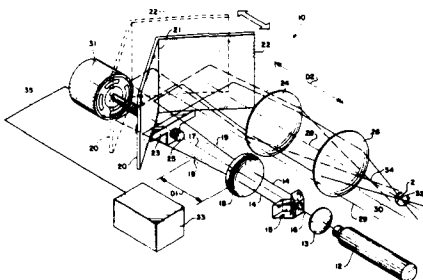
N87-17026* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PROJECTION LENS SCANNING LASER VELOCIMETER SYSTEM Patent

WILLIAM D. GUNTER, JR., inventor (to NASA) and ANEMARIE DEYOUNG, inventor (to NASA) 30 Dec. 1986 7 p Filed 18 Jan. 1985 Supersedes N85-20320 (23 - 11, p 1638) (NASA-CASE-ARC-11547-1; US-PATENT-4,632,548; US-PATENT-APPL-SN-692745; US-PATENT-CLASS-356-28.5; US-PATENT-CLASS-356-28) Avail: US Patent and Trademark Office CSCL 20E

A laser Doppler velocimeter system is disclosed that has a laser, a waist position adjusting lens, and a beam splitter which direct laser beams parallel to the optical axis of the negative lens. The negative lens is fixed relative to an afocal lens pair. A pair of planar mirrors intersect at right angles and respectively intersect the optical axis and the optical axis of the afocal lens pair. Mirrors are movable along the optical axis toward and away from the afocal lens pair to focus the laser beams in focus area while maintaining a constant beam waist, crossing angle, and intersection with other laser beams. This produces a constant sensitive volume as the focus is changed.

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37

MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

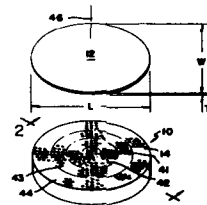
N87-14704*# National Aeronautics and Space Administration. Pasadena Office, Calif.

ACTIVE HOLD-DOWN FOR HEAT TREATING Patent Application

E. R. COLLINS, JR., inventor (to NASA) 21 Oct. 1986 12 p (Contract NAS7-918)

(NASA-CASE-NPO-16892-1-CU; NAS 1.71:NPO-16892-1-CU; US-PATENT-APPL-SN-921573) Avail: NTIS HC A02/MF A01 CSCL 13I

The object of the disclosure is to provide a vacuum hold-down for holding thin sheets to a support surface, which permits the thin sheet to change dimensions as it is held down. The hold-down includes numerous holes in the support surface, through which a vacuum is applied from a vacuum source. The holes are arranged in zones. The vacuum is repeatedly interrupted at only one or a few zones, while it continues to be applied to other zones, to allow the workpiece to creep along that interrupted zone. The vacuum to different zones is interrupted at different times, as by a slowly turning valve number, to allow each zone of the workpiece to creep. A positive pressure may be applied from a pressured air source to a zone when the vacuum is interrupted there, to help lift the corresponding workpiece zone off the surface to aid in creeping. The workpiece may undergo dimensional changes because of heating, cooling, drying, or other procedure. NASA



N87-14705*# National Aeronautics and Space Administration. Pasadena Office, Calif.

PASSIVELY ACTIVATED PREHENSILE DIGIT FOR A ROBOTIC END EFFECTOR Patent Application

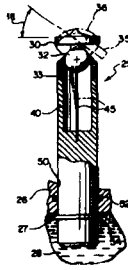
E. R. COLLINS, JR., inventor (to NASA) 21 Oct. 1986 14 p (Contract NAS7-918)

(NASA-CASE-NPO-16766-1-CU; NAS 1.71:NPO-16766-1-CU; US-PATENT-APPL-SN-921577) Avail: NTIS HC A02/MF A01 CSCL 13I

A common hydraulic reservoir holds one or more rows of slidable pistons or fingers in a base or hand. The individual fingers in each row expose graduated cross-sectional fluid application areas to the hydraulic fluid in the reservoir, with the smallest fluid application area in the center of the row and graduating to progressive larger fluid areas towards both ends of each row. The fingers are elongated pistons. Exposed outer ends of each piston extending away from the reservoir, house a transverse pad to contact an object to be held. The transverse pads are universally ball-joint and spring-center mounted in a longitudinally located

37 MECHANICAL ENGINEERING

opening at the outer tapered end of each finger. Simple and effective capacitance metering in the reservoir is provided for each finger. NASA

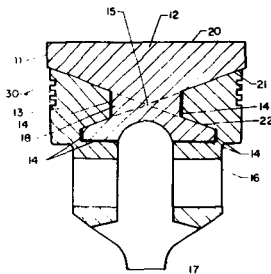


N87-15464*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

COMPOSITE PISTON Patent Application

ALLAN H. TAYLOR, inventor (to NASA) 30 Jul. 1986 17 p
(NASA-CASE-LAR-13435-1; NAS 1.71:LAR-13435-1;
US-PATENT-APPL-SN-890683) Avail: NTIS HC A02/MF A01
CSCL 940

A composite piston structure is disclosed which provides a simple and reliable means for joining a carbon-carbon or ceramic piston cap with a metallic piston body. Attachment is achieved by means of a special geometry which compensates for differences in thermal expansion without complicated mechanical fastening devices. The shape employs a flange created by opposed frustoconical shapes with coincident vertices intersecting on the radial centerline of the piston in order to retain the piston cap. The use of carbon-carbon for the piston cap material allows a close fit between the piston and a cylinder wall, eliminating the need for piston rings. The elimination of extra mechanical parts of previous composite pistons provides a lightweight composite piston capable of extended high temperature operation. NASA



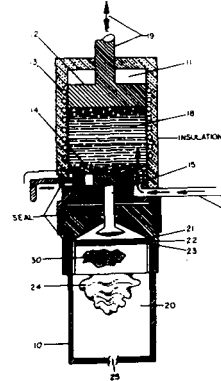
N87-15465*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

INFUSION EXTRACTOR Patent Application

FRANKLIN R. CHANG-DIAZ, inventor (to NASA) 30 Sep. 1986 15 p
(NASA-CASE-MSC-20761-1; NAS 1.71:MSC-20761-1;
US-PATENT-APPL-SN-913446) Avail: NTIS HC A02/MF A01
CSCL 131

This invention relates to an apparatus and method of removing desirable constituents from an infusible material by infusion

extraction. A piston operating in a first chamber draws a solvent into the first chamber where it may be heated, and then moves the heated solvent into a second chamber containing the infusible material, where infusion extraction takes place. The piston then moves the solvent containing the extract through a filter into the first chamber, leaving the extraction residue in the second chamber. The method is applicable to operation in low or micro-gravity environments. NASA



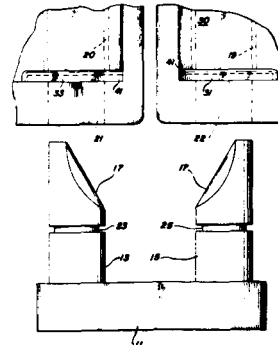
N87-17034* National Aeronautics and Space Administration. Pasadena Office, Calif.

TANK TREAD ASSEMBLIES WITH TRACK-LINKING MECHANISM Patent

EARL R. COLLINS, JR., inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena) 2 Dec. 1986 8 p Filed 18 Jan. 1985 Supersedes N85-29291 (23 - 18, p 3117)
(NASA-CASE-NPO-16321-1CU; US-PATENT-4,626,046;
US-PATENT-APPL-SN-692802; US-PATENT-CLASS-305-36;
US-PATENT-CLASS-305-58PC; US-PATENT-CLASS-305-51;
US-PATENT-CLASS-305-58R; US-PATENT-CLASS-474-220)
Avail: US Patent and Trademark Office CSCL 13F

The proposed tank tread assembly has adjacent tank tread segments joined by a link bearing tapered pins retained by clips inserted through the tread shells perpendicular to the axes of the pin. It also has highway pads attached by a release rod bearing tapered, grooved cams which interlockingly engage tabs inserted into the tread shells.

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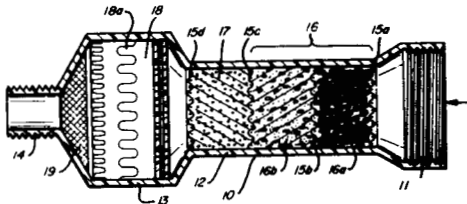


N87-17035* National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.
**SELF-CONTAINED, SINGLE-USE HOSE AND TUBING
CLEANING MODULE Patent**

FRED P. ROLLINS, inventor (to NASA) (Lockheed Engineering and Management Services Co., Inc., Houston, Tex.) and JAMES S. GLASS, inventor (to NASA) 13 Jan. 1987 5 p Filed 3 Oct. 1985 Supersedes N86-20807 (24 - 11, p 1784)
(NASA-CASE-MSC-20857-1; US-PATENT-4,635,663;
US-PATENT-APPL-SN-783886; US-PATENT-CLASS-134-93;
US-PATENT-CLASS-134-166C; US-PATENT-CLASS-210-282)
Avail: US Patent and Trademark Office CSCL 131

A self contained, single use hose and tubing cleaning module which utilizes available water supplies without requiring access to precision cleaning facilities is presented. The module is attached to the water source at the inlet side and to the hose or tubing to be cleaned at the outlet side. The water flows through a water purification zone, a detergent dispensing zone, a filtration zone before the detergent laden water flows into the tubing to clean the tubing walls. The module contains an embedded pad which is impregnated with a pH indicator to indicate to the user when the detergent has dissolved and rinsing of the tubing begins.

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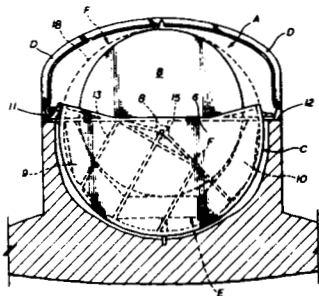


N87-17036* National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.
SUN SHIELD Patent

ARTHUR M. FRANK, inventor (to NASA), SILVIO F. DERESPINIS, inventor (to NASA), and JOHN MOCKOVCIK, JR., inventor (to NASA) 20 Jan. 1987 8 p Filed 12 Aug. 1985 Supersedes N86-20803 (24 - 11, p 1783)
(NASA-CASE-MSC-20162-1; US-PATENT-4,637,447;
US-PATENT-APPL-SN-764805; US-PATENT-CLASS-160-265;
US-PATENT-CLASS-160-23R; US-PATENT-CLASS-244-121;
US-PATENT-CLASS-244-158R; US-PATENT-CLASS-135-903;
US-PATENT-CLASS-296-100) Avail: US Patent and Trademark Office CSCL 131

A shading device which is capable of compactly storing a flexible shade on a biased, window shade type spring roller is disclosed. It is controlled to deliver the shade selectively to either its operative shading or compact storage orientation.

Official Gazette of the US Patent and Trademark Office

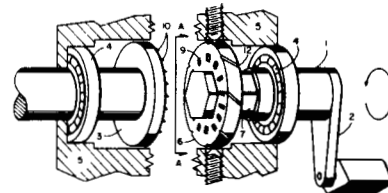


N87-17037* National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, Ala.

NON-BACKDRIVEABLE FREE WHEELING COUPLING Patent
WILLIAM R. LEWELLIN, inventor (to NASA) (Martin Marietta Corp., Bethesda, Md.) 13 Jan. 1987 7 p Filed 22 Apr. 1985 Supersedes N85-29290 (23 - 18, p 3116)
(NASA-CASE-MSC-20475-1; US-PATENT-4,635,773;
US-PATENT-APPL-SN-725689; US-PATENT-CLASS-192-46;
US-PATENT-CLASS-192-67R) Avail: US Patent and Trademark Office CSCL 131

A rotary coupling for connecting a driven part to a source of rotary force is described. This device transmits rotary force in one direction only and disengages to permit the driven part to free wheel when the input member is stopped and precludes the backdriving of rotary force from output member to input member. The coupling includes an input member having a splined shaft, a coupling member connected to the splined shaft, and a coaxial output member. The coupling member and the output member having complementary sets of axially facing clutch teeth. Guides in the form of helical grooves on the coupling member and spring loaded followers acting with the guides affect the engagement and disengagement of the clutch teeth by moving the coupling member toward and away from output member, the followers and guides themselves disengaging to permit free wheeling of output member when input member is stopped.

Official Gazette of the US Patent and Trademark Office



N87-17038* National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.

RADIAL AND TORSIONALLY CONTROLLED MAGNETIC BEARING Patent

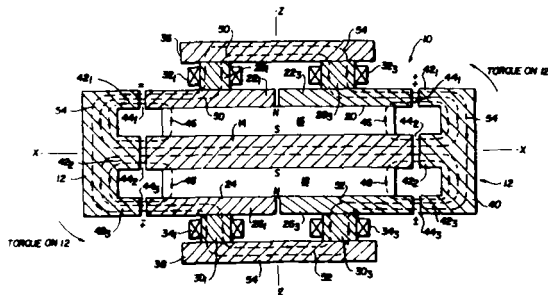
PHILIP A. STUDER, inventor (to NASA) 6 Jan. 1987 13 p Filed 21 Nov. 1985 Supersedes N86-20804 (24 - 11, p 1784)
(NASA-CASE-GSC-12957-1; US-PATENT-4,634,191;
US-PATENT-APPL-SN-800193; US-PATENT-CLASS-310-90.5)
Avail: US Patent and Trademark Office CSCL 131

A magnetic bearing including a circular stator member with a plurality of circumferential pole faces and a suspended annular ring member with corresponding number of inward facing circumferential pole faces separated by respective air gaps is presented. A source of dc magnetic flux circulates flux between the circumferential pole faces of the stator and the ring to provide axial stability along a central longitudinal axis. Flux coil means are included on the stator member to provide variable flux density along predetermined radial paths to provide active radial stabilization. Flux coil means are included on the stator to actively modulate the magnitude of the magnetic forces as well as their direction by differential flux control involving the dc magnetic flux

37 MECHANICAL ENGINEERING

to produce torquing moments about a pair of mutually orthogonal axes which are perpendicular to the central axis.

Official Gazette of the US Patent and Trademark Office

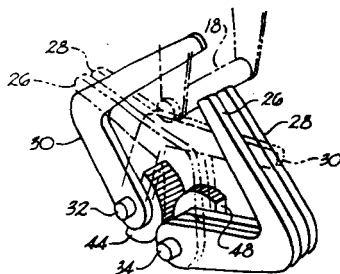


N87-18817*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ORBITAL MANEUVERING END EFFECTORS Patent Application

W. NEILL MYERS, inventor (to NASA), JOHN C. FORBES, inventor (to NASA), and WAYNE L. BARNES, inventor (to NASA) 16 Dec. 1986 12 p

(NASA-CASE-MFS-28161-1; NAS 1.71:MFS-28161-1; US-PATENT-APPL-SN-942159) Avail: NTIS HC A02/MF A01 CSCL 131

This invention relates to an end effector device for grasping and maneuvering objects such as berthing handles of a space telescope. The device includes a V-shaped capture window defined as inclined surfaces in parallel face plates which converge toward a retainer recess in which the handle is retained. A pivotal finger (30) meshes with a pair of pivoted fingers which rotate in counterrotation. The fingers rotate to pull a handle within the capture window into recess where latches lock handle in the recess. To align the capture window, plates may be cocked plus or minus five degrees on base. Drive means is included in the form of a motor coupled with a harmonic drive speed reducer, which provides for slow movement of the fingers at a high torque so that large articles may be handled. Novelty of the invention is believed to reside in the combined intermeshing finger structure, drive means and the harmonic drive speed reducer, which features provide the required maneuverability and strength. NASA



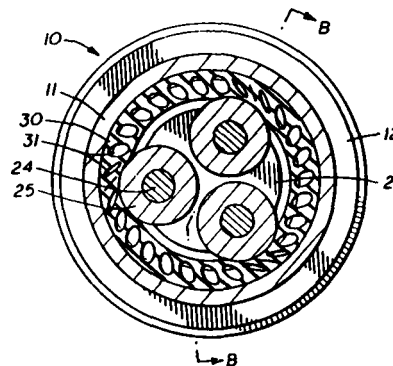
N87-18818*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

MULTI-PATH PERISTALTIC PUMP Patent Application

JOSEPH A. CHANDLER, inventor (to NASA) 7 Nov. 1986 15 p

(NASA-CASE-MSC-20907-1; NAS 1.71:MSC-20907-1; US-PATENT-APPL-SN-927992) Avail: NTIS HC A02/MF A01 CSCL 13K

The instant invention is directed to a peristaltic pump for critical laboratory or hospital applications requiring precise flow rates over an extended period of time. Within the cylindrical barrel pump housing is a single-piece, molded, elastomeric, cylindrical liner with a multiplicity of flattened helical channels created therein from one end of the liner to the other. Three cylindrical rollers rotate about the center axis of the pump around the inside surface of the liner selectively compressing the liner, and hence the helical channels between the rollers and the barrel housing, creating a pumping action by forcing trapped fluid in the helical channels axially from one end of the liner to the opposite end. The novelty of the invention appears to lie in the provision of the special liner with multiple helical channels as the pumping chamber, rather than the standard single elastomeric tubing which is squeezed repeatedly by rollers to move the liquid through a typical peristaltic pump. Large, repeated deflections on the standard tubing causes a permanent set in the tubing, thus either changing the flow rate, or requiring a new section of tubing to be positioned in the pump head. Further, this configuration minimizes the amount of outflow pulsation which is characteristic of a typical single tubing peristaltic pump. NASA



44

ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower.

N87-17399* National Aeronautics and Space Administration. Pasadena Office, Calif.

HIGH BAND GAP 2-6 AND 3-5 TUNNELING JUNCTIONS FOR SILICON MULTIJUNCTION SOLAR CELLS Patent

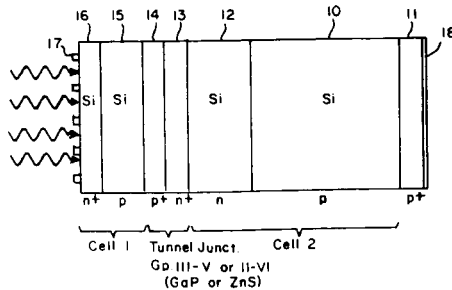
TAHER DAUD, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena) and AKARAM H. KACHARE, inventor (to NASA) 23 Dec. 1986 5 p

(NASA-CASE-NPO-16526-1CU; US-PATENT-4,631,352; US-PATENT-APPL-SN-809975; US-PATENT-CLASS-136-249) Avail: US Patent and Trademark Office CSCL 10A

A multijunction silicon solar cell of high efficiency is provided by providing a tunnel junction between the solar cell junctions to connect them in series. The tunnel junction is comprised of p+ and n+ layers of high band gap 3-5 or 2-6 semiconductor materials that match the lattice structure of silicon, such as GaP (band gap 2.24 eV) or ZnS (band gap 3.6 eV). Each of which has a perfect

lattice match with silicon to avoid defects normally associated with lattice mismatch.

Official Gazette of the US Patent and Trademark Office



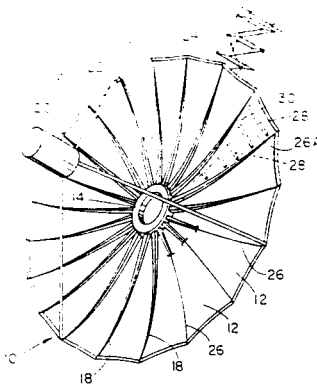
N87-18921*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

SCALLOPED-GEOMETRY SOLAR CONCENTRATOR Patent Application

HOWARD ANDREW WAGNER, inventor (to NASA) 29 Oct. 1986 27 p

(NASA-CASE-MSC-21061-1; NAS 1.71:MSC-21061-1; US-PATENT-APPL-SN-924400) Avail: NTIS HC A03/MF A01 CSCL 10A

An improved solar collector is provided for concentrating solar energy at a target aperture of a receiver. The dispersion of reflected rays to the target aperture is substantially minimized over prior art arrangements. The collector is well suited as a component of a solar dynamic power unit for terrestrial use as well as space vehicles, concentrating sunlight to drive a heat engine. The solar concentrator includes a generally paraboloidal shape which is composed of sections or gores of compound curvature, the two inner edges of each gore (which abut the corresponding edges of adjacent gores) are parabolas. The compound curvature between the two edges of each gore being defined, in cross section, by a circular arc having its center at the focal point of the paraboloid. Novelty is believed to reside in the compound geometry which combines the advantages of both parabolas and circular arcs to minimize the dispersion of reflected rays from the desired target aperture. NASA



COMPUTER OPERATIONS AND HARDWARE

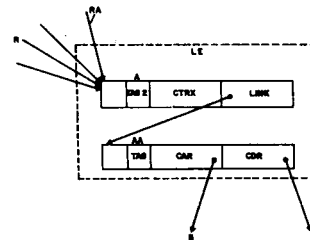
Includes hardware for computer graphics, firmware, and data processing.

N87-14863*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

REAL-TIME GARBAGE COLLECTION FOR LIST PROCESSING Patent Application

R. L. SHULER, JR., inventor (to NASA) 26 Jun. 1986 31 p (NASA-CASE-MSC-20964-1; NAS 1.71:MSC-20964-1; US-PATENT-APPL-SN-878916) Avail: NTIS HC A03/MF A01 CSCL 09B

In a list processing system, small reference counters are maintained in conjunction with memory cells for the purpose of identifying memory cells that become available for re-use. The counters are updated as references to the cells are created and destroyed, and when a counter of a cell is decremented to logical zero the cell is immediately returned to a list of free cells. In those cases where a counter must be incremented beyond the maximum value that can be represented in a small counter, the cell is restructured so that the additional reference count can be represented. The restructuring involves allocating an additional cell, distributing counter, tag, and pointer information among the two cells, and linking both cells appropriately into the existing list structure. NASA



COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

N87-19021*# National Aeronautics and Space Administration. Pasadena Office, Calif.

LOCAL AREA NETWORK WITH FAULT-CHECKING, PRIORITIES AND REDUNDANT BACKUP Patent Application

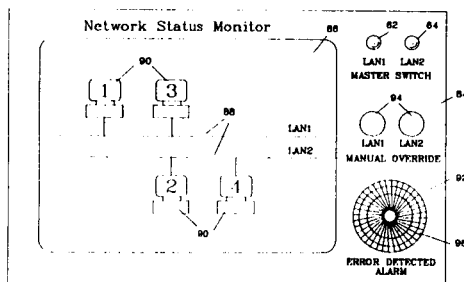
SERGIO MORALES, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena) and GARY L. FRIEDMAN, inventor (to NASA) 8 Sep. 1986 26 p (Contract NAS7-918)

(NASA-CASE-NPO-16949-1-CU; NAS 1.71:NPO-16949-1-CU; US-PATENT-APPL-SN-927987) Avail: NTIS HC A03/MF A01 CSCL 09B

This invention is a redundant error detecting and correcting local area networked computer system having a plurality of nodes each including a network connector board within the node for connecting to an interfacing transceiver operably attached to a network cable. There is a first network cable disposed along a path to interconnect the nodes. The first network cable includes

a plurality of first interfacing transceivers attached thereto. A second network cable is disposed in parallel with the first cable and, in like manner, includes a plurality of second interfacing transceivers attached thereto. There are a plurality of three position switches each having a signal input, three outputs for individual selective connection to the input, and a control input for receiving signals designating which of the outputs is to be connected to the signal input. Each of the switches includes means for designating a response address for responding to addressed signals appearing at the control input and each of the switches further has its signal input connected to a respective one of the input/output lines from the nodes. Also, one of the three outputs is connected to a respective one of the plurality of first interfacing transceivers. There is master switch control means having an output connected to the control inputs of the plurality of three position switches and an input for receiving directive signals for outputting addressed switch position signals to the three position switches as well as monitor and control computer means having a pair of network connector boards therein connected to respective ones of one of the first interfacing transceivers and one of the second interfacing transceivers and an output connected to the input of the master switch means for monitoring the status of the networked computer system by sending messages to the nodes and receiving and verifying messages therefrom and for sending control signals to the master switch to cause the master switch to cause respective ones of the nodes to use a desired one of the first and second cables for transmitting and receiving messages and for disconnecting desired ones of the nodes from both cables.

NASA



74

OPTICS

Includes light phenomena; and optical devices.

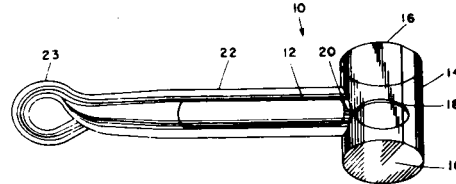
N87-14971* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
HIGH-TEMPERATURE, HIGH-PRESSURE OPTICAL CELL
Patent

R. P. HARRIS, inventor (to NASA), L. R. HOLLAND, inventor (to NASA) (Alabama Univ., University.), and R. E. SMITH, inventor (to NASA) 30 Sep. 1986 7 p Filed 17 Jan. 1984 Supersedes N84-16986 (22 - 07, p 1075)
(NASA-CASE-MFS-26000-1; US-PATENT-4,614,428;
US-PATENT-APPL-SN-571615; US-PATENT-CLASS-356-246;
US-PATENT-CLASS-372-61) Avail: US Patent and Trademark Office CSCL 20F

The invention is an optical cell for containment of chemicals under conditions of high temperature and high pressure. The cell is formed of a vitreous silica tube, two optical windows comprising a vitreous silica rod inserted into the ends of a tube, and fused into position in the tube ends. Windows are spaced apart to form a cavity enclosed by the tube and the windows. A hole is drilled

radially through the tube and into the cavity. Another vitreous silica tube is fused to the silica tube around the hole to form the stem, which is perpendicular to the long axis of the tube. The open end of the stem is used to load chemicals into the cavity. Then the stem may be sealed, and if desired, it may be shortened in order to reduce the volume of the cavity, which extends into the stem.

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N87-15786* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SELF-CLAMPING ARC LIGHT REFLECTOR FOR WELDING TORCH Patent Application

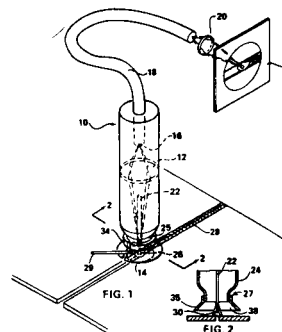
STEPHEN S. GORDON, inventor (to NASA) (Rockwell International Corp., Canoga Park, Calif.) 30 Sep. 1986 11 p
(Contract NAS8-27980)

(NASA-CASE-MFS-29207-1; NAS 1.71:MFS-29207-1;

US-PATENT-APPL-SN-913447) Avail: NTIS HC A02/MF A01 CSCL 20F

The invention is directed to a coaxial extending metal mirror reflector attached to the electrode housing or gas cup on a welding torch. An electric welding torch with an internal viewing system for robotic welding is provided with an annular arc light reflector to reflect light from the arc back onto the workpiece. The reflector has a vertical split or gap in its surrounding wall to permit the adjacent wall ends forming the split to be sprung open slightly to permit the reflector to be removed or slipped onto the torch housing or gas cup. The split or gap also permits the feed of weld wire therethrough to the weld area. The reflected light provides an even light distribution onto the darker surrounding areas. Novelty lies in the use of a split annular arc light reflector on the end of a welding torch having an internal viewing system.

NASA



N87-17493* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

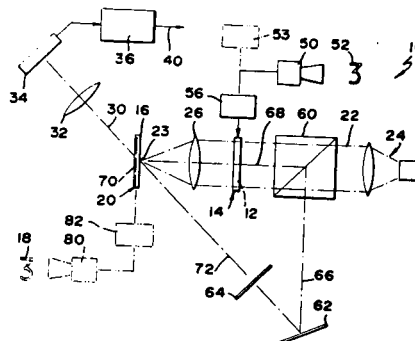
WELDING TORCH WITH ARC LIGHT REFLECTOR Patent

STEPHEN S. GORDON, inventor (to NASA) (Rockwell International Corp., Canoga Park, Calif.) 30 Dec. 1986 5 p Filed 3 Oct. 1985 Supersedes N86-20130 (24 - 10, p 1670) (NASA-CASE-MFS-29134-1; US-PATENT-4,633,060; US-PATENT-APPL-SN-783890; US-PATENT-CLASS-219-130.01; US-PATENT-CLASS-219-124.34) Avail: US Patent and Trademark Office CSCL 20F

A welding torch arc light reflector is disclosed for welding torches having optical viewing systems. A schematic of a welding torch having an internal coaxial viewing system consisting of a lens which focuses the field of view of the weld scene of the workpiece onto the end of the fiberoptic bundle is provided. The transmitted image of the fiberoptic bundle is provided to a camera lens which focuses it onto a TV sensor array for transmission. To improve the parity of the image of the monitoring system, an arc light reflector is shown fitted to the end of the torch housing or gas cup. The arc light reflector has an internal conical section portion which is polished to serve as a mirror which reflects the bright arc light back onto the darker areas of the weld area and thereby provides a more detailed image for the monitoring system. The novelty of the invention lies in the use of an arc light reflector on welding torches having optical viewing systems.

Official Gazette of the US Patent and Trademark Office

the image and using those signals to drive a liquid crystal array through which light passes. NASA



76

SOLID-STATE PHYSICS

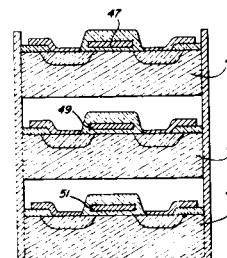
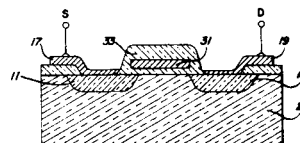
Includes superconductivity.

N87-13313* National Aeronautics and Space Administration. Pasadena Office, Calif.

FET CHARGE SENSOR AND VOLTAGE PROBE Patent

P. A. ROBINSON, JR., inventor (to NASA) 12 Aug. 1986 7 p (NASA-CASE-NPO-16045-1; US-PATENT-4,605,946; US-PATENT-APPL-SN-641146; US-PATENT-CLASS-357-23.1; US-PATENT-CLASS-357-23.12; US-PATENT-CLASS-357-29; US-PATENT-CLASS-357-52; US-PATENT-CLASS-357-30; US-PATENT-CLASS-250-338; US-PATENT-CLASS-250-370) Avail: US Patent and Trademark Office CSCL 20L

A MOSFET structure having a biased gate covered with an insulator is described. The insulator is of such a thickness as to render the structure capable of giving a measure of accumulated charge. The structure is also capable of being used in a stacked structure as a particle spectrometer. E.R.



N87-19064*# National Aeronautics and Space Administration. Pasadena Office, Calif.

REMOTELY CONTROLLABLE REAL-TIME OPTICAL PROCESSOR Patent Application

HUA-KUANG LIU, inventor (to NASA) 7 Nov. 1986 12 p (Contract NAS7-918) (NASA-CASE-NPO-16750-1-CU; US-PATENT-APPL-SN-927972; NAS 1.71; NPO-16750-1-CU) Avail: NTIS HC A02/MF A01 CSCL 20F

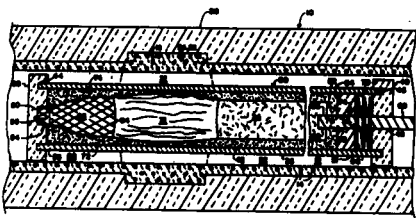
An optical processor is provided which facilitates selection of any of a variety of patterns or images which are to be compared with a Fourier transform of a template image, wherein the processor can be constructed at low cost. One of the two images that are to be compared is formed by generating video signals representing

N87-15004*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

LIQUID ENCAPSULATED FLOAT ZONE PROCESS AND APPARATUS Patent Application

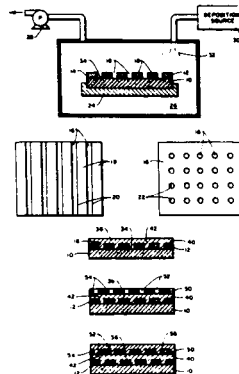
R. J. NAUMANN, D. O. FRAZIER, S. L. LEHOCZKY, M. VLASSE, and B. R. FACEMIRE, inventors (to NASA) 29 Oct. 1986 15 p (NASA-CASE-MFS-28144-1; NAS 1.71:MFS-28144-1; US-PATENT-APPL-SN-924399) Avail: NTIS HC A02/MF A01 CSCL 46D

Process and apparatus for growing crystals using float zone techniques are described. A rod of crystalline materials is disposed in a cylindrical container, with a space being left between the rod and container walls. The space is filled with an encapsulant, selected to have a slightly lower melting point than the crystalline material. The rod is secured to a container end cap at one end and to a shaft at its other end. A piston slides over the rod and provides pressure to prevent loss of volatile components upon melting of the rod. Prior to melting the rod the container is first heated to melt the encapsulant, with any off-gas from this step being vented to a cavity behind the piston. The piston moves slightly forward owing to volume change upon melting of the encapsulant, and the vent passageway is closed. The container is then moved longitudinally through a heated zone to progressively melt sections of the rod as in conventional float zone processes. The float zone technique may be used in the microgravity environment of space. NASA



overlying the openings are exposed to defects and impurities. The process can be iterated and the mask translated to further improve the quality of grown layers.

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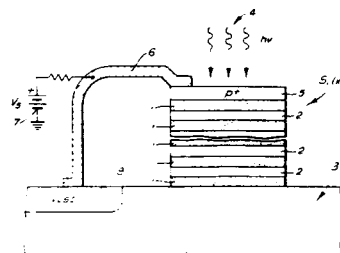
N87-15883*# National Aeronautics and Space Administration. Pasadena Office, Calif.

TAILORABLE INFRARED SENSING DEVICE WITH STRAIN LAYER SUPERLATTICE STRUCTURE Patent Application

LI-JEN CHENG, inventor (to NASA) 28 Aug. 1986 19 p (Contract NAS7-918)

(NASA-CASE-NPO-16607-1CU; NAS 1.71:NPO-16607-1; US-PATENT-APPL-SN-901114) Avail: NTIS HC A02/MF A01 CSCL 20L

An infrared photodetector is formed of a heavily doped p-type Ge sub x Si sub 1-x/Si superlattice in which x is pre-established during manufacture in the range 0 to 100 percent. A custom tailored photodetector that can differentiate among close wavelengths in the range of 2.7 to 50 microns is fabricated by appropriate selection of the alloy constituency value, x, to establish a specific wavelength at which photodetection cut-off will occur. NASA



N87-15882*# National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD FOR GROWING LOW DEFECT, HIGH PURITY CRYSTALLINE LAYERS UTILIZING LATERAL OVERGROWTH OF A PATTERNED MASK Patent

ANDREW D. MORRISON, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) and TAHER DAUD, inventor (to NASA) 16 Sep. 1986 6 p Filed 28 Feb. 1985 Supersedes N85-30933 (23 - 19, p 3374) US-Patent-Appl-SN-507624, filed 24 Jun. 1983 Sponsored by NASA

(NASA-CASE-NPO-15813-2; US-PATENT-4,612,072; US-PATENT-APPL-SN-706564; US-PATENT-CLASS-148-175; US-PATENT-CLASS-29-576-E; US-PATENT-CLASS-29-576-J; US-PATENT-CLASS-29-576-W; US-PATENT-CLASS-29-575; US-PATENT-CLASS-29-578; US-PATENT-CLASS-148-174)

Avail: US Patent and Trademark Office CSCL 20B

A method for growing a high purity, low defect layer of semiconductor is described. This method involves depositing a patterned mask of a material impervious to impurities of the semiconductor on a surface of a blank. When a layer of semiconductor is grown on the mask, the semiconductor will first grow from the surface portions exposed by the openings in the mask and will bridge the connecting portions of the mask to form a continuous layer having improved purity, since only the portions

N87-19115*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

PROCEDURE TO PREPARE TRANSPARENT SILICA GELS Patent Application

PATRICK G. BARBER, inventor (to NASA) (Longwood Coll., Farmville, Va.) and NORMAN R. SIMPSON, inventor (to NASA) 24 Nov. 1986 11 p

(NASA-CASE-LAR-13476-1-CU; NAS 1.71:LAR-13476-1-CU; US-PATENT-APPL-SN-933961) Avail: NTIS HC A02/MF A01 CSCL 20B

This invention relates to the production of silica gels and in particular to a process for the preparation of silica gels which can be used as a crystal growth medium that simulates the convectionless environment of space to produce structurally perfect

crystals. Modern utilizations of substances in electronics, such as radio transmitters and high frequency microphones, often require single crystals with controlled purity and structural perfection. The near convectionless environment of silica gel suppresses nucleation, thereby reducing the competitive nature of crystal growth, and provides a medium for growing single crystals with structural perfection and controlled purity. Previous methods of producing silica gels result in cloudy, translucent gels, while it is much more desirable to produce transparent gels so that the crystals can be more easily observed. In the current process, sodium ions in a sodium silicate solution are replaced with potassium ions from a soluble potassium salt solution by using cation exchange resin beads. The resulting treated silicate solution is then added to a volume of boiled, cooled distilled water, after which a volume of acetic acid solution is added to the mixture of distilled water and treated silicate solution. This mixture is then allowed to gel at room temperature, whereby a transparent silica gel is produced.

NASA

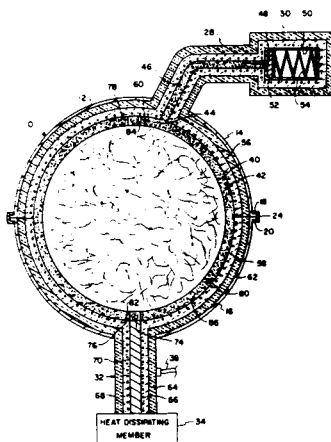
N87-19116*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

METHOD AND APPARATUS FOR GROWING CRYSTALS Patent Application

ROBERT J. NAUMANN, inventor (to NASA), SANDOR L. LEHOCZKY, inventor (to NASA), and DONALD O. FRAZIER, inventor (to NASA) 31 Oct. 1986 20 p
(NASA-CASE-MFS-28137-1; NAS 1.71:MFS-28137-1;
US-PATENT-APPL-SN-925189) Avail: NTIS HC A02/MF A01
CSCL 20B

This invention relates to a method and apparatus for bulk growth of defect-free compound crystals. Crystal growth is carried out in the present invention in an apparatus having an enclosure with a spherical interior which is provided with an adjustable heat source. A seed crystal is positioned within this interior and is connected to one end of a rod of heat conductive material which extends through the enclosure. The rod is independently heated, and a heat absorber is connected to an opposite end of the rod. Crystalline material is placed in the interior of the sphere and in engagement with the seed crystal, and pressure is applied to it. Encapsulant material having a slightly lower melting point than the crystalline material is disposed between the latter and the spherical container wall. A crystal structure is grown by heating the crystalline material up to a predetermined temperature while controlling heat dissipation through the rod by the application of heat to the rod. Heat application is reduced, allowing heat to escape via the seed crystal and the rod of material, causing the crystalline material to be deposited as a single crystal on the seed crystal. Novelty of the invention is believed to reside in the use of a spherical container with a heat removal rod at one pole of the sphere, the rod providing for control of the shape of the crystal-liquid interface during solidification. These features enable growth of relatively large, defect-free crystals of compound materials.

NASA



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Inquiries concerning the NASA Patent Licensing Program or the availability of licenses for the commercial use of NASA-owned inventions covered by U.S. patents or pending applications for patent should be forwarded to the NASA Patent Counsel of the NASA installation having cognizance of the specific invention, or the Associate General Counsel for Intellectual Property, code GP, National Aeronautics and Space Administration, Washington, D.C. 20546. Inquiries should refer to the NASA Case Number, the Title of the Invention, and the U.S. Patent Number or the U.S. Application Serial Number assigned to the invention as shown in *NASA PAB*.

The NASA Patent Counsel having cognizance of the invention is determined by the first three letters or prefix of the NASA Case Number assigned to the invention. The addresses of NASA Patent Counsels are listed alongside the NASA Case Number prefix letters in the following table.

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**NASA Case
Number
Prefix Letters**

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PATENT LICENSING REGULATIONS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

14 CFR Part 1245

Licensing of NASA Inventions

AGENCY: National Aeronautics and Space Administration.

ACTION: Interim regulation with comments requested.

SUMMARY: The National Aeronautics and Space Administration (NASA) is revising its patent licensing regulations to conform with Pub. L. 96-517. This interim regulation provides policies and procedures applicable to the licensing of federally owned inventions in the custody of the National Aeronautics and Space Administration, and implements Pub. L. 96-517. The object of this subpart is to use the patent system to promote the utilization of inventions arising from NASA supported research and development.

EFFECTIVE DATE: July 1, 1981. Comments must be received in writing by December 2, 1981. Unless a notice is published in the *Federal Register* after the comment period indicating changes to be made, this interim regulation shall become a final regulation.

ADDRESS: Mr. John G. Mannix, Director of Patent Licensing, GP-4, NASA, Washington, D.C. 20546.

FOR FURTHER INFORMATION CONTACT: Mr. John G. Mannix, (202) 755-3954.

SUPPLEMENTARY INFORMATION:

PART 1245—PATENTS AND OTHER INTELLECTUAL PROPERTY RIGHTS

Subpart 2 of Part 1245 is revised to read as follows

Subpart 2—Licensing of NASA Inventions

Sec.

- 1245.200 Scope of subpart.
- 1245.201 Policy and objective.
- 1245.202 Definitions.
- 1245.203 Authority to grant licenses.

Restrictions and Conditions

- 1245.204 All licenses granted under this subpart.

Types of Licenses

- 1245.205 Nonexclusive licenses.
- 1245.206 Exclusive and partially exclusive licenses.

Procedures

- 1245.207 Application for a license.
- 1245.208 Processing applications.
- 1245.209 Notice to Attorney General.

- 1245.210 Modification and termination of licenses.

- 1245.211 Appeals.

- 1245.212 Protection and administration of inventions.

- 1245.213 Transfer of custody.

- 1245.214 Confidentiality of information.

Authority: 35 U.S.C. Section 207 and 208, 94 Stat. 3023 and 3024.

Subpart 2—Licensing of NASA Inventions

§ 1245.200 Scope of subpart.

This subpart prescribes the terms, conditions, and procedures upon which a NASA invention may be licensed. It does not affect licenses which (a) were in effect prior to July 1, 1981; (b) may exist at the time of the Government's acquisition of title to the invention, including those resulting from the allocation of rights to inventions made under Government research and development contracts; (c) are the result of an authorized exchange of rights in the settlement of patent disputes; or (d) are otherwise authorized by law or treaty.

§ 1245.201 Policy and objective.

It is the policy and objective of this subpart to use the patent system to promote the utilization of inventions arising from NASA supported research and development.

§ 1245.202 Definitions.

(a) "Federally owned invention" means an invention, plant, or design which is covered by a patent, or patent application in the United States, or a patent, patent application, plant variety protection, or other form of protection, in a foreign country, title to which has been assigned to or otherwise vested in the United States Government.

(b) "Federal agency" means an executive department, military department, Government corporation, or independent establishment, except the Tennessee Valley Authority, which has custody of a Federally owned invention.

(c) "NASA Invention" means a Federally owned invention with respect to which NASA maintains custody and administration, in whole or in part, of the right, title or interest in such invention on behalf of the United States Government.

(d) "Small business firm" means a small business concern as defined at section 2 of Pub. L. 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration. For the purpose of these regulations, the size standard for small business concerns involved in Government procurement, contained in

13 CFR 121.3-8, and in subcontracting, contained in 13 CFR 121.3-12, will be used.

(e) "Practical application" means to manufacture in the case of a composition or product, to practice in the case of a process or method, or to operate in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are to the extent permitted by law or Government regulations available to the public on reasonable terms.

(f) "United States" means the United States of America, its territories and possessions, the District of Columbia, and the Commonwealth of Puerto Rico.

§ 1245.203 Authority to grant licenses.

NASA inventions shall be made available for licensing as deemed appropriate in the public interest. NASA may grant nonexclusive, partially exclusive, or exclusive licenses thereto under this subpart on inventions in its custody.

Restrictions and Conditions

§ 1245.204 All licenses granted under this subpart.

(a) **Restrictions.** (1) A license may be granted only if the applicant has supplied NASA with a satisfactory plan for development or marketing of the invention, or both, and with information about the applicant's capability to fulfill the plan.

(2) A license granting rights to use or sell under a NASA invention in the United States shall normally be granted only to a licensee who agrees that any products embodying the invention or produced through the use of the invention will be manufactured substantially in the United States.

(b) **Conditions.** Licenses shall contain such terms and conditions as NASA determines are appropriate for the protection of the interests of the Federal Government and the public and are not in conflict with law or this subpart. The following terms and conditions apply to any license:

(1) The duration of the license shall be for a period specified in the license agreement, unless sooner terminated in accordance with this subpart.

(2) The license may be granted for all or less than all fields of use of the invention or in specified geographical areas, or both.

(3) The license may extend to subsidiaries of the licensee or other parties if provided for in the license but shall be nonassignable without approval of NASA, except to the successor of that part of the licensee's business to which the invention pertains.

PATENT LICENSING REGULATIONS

(4) The license may provide the licensee the right to grant sublicenses under the license, subject to the approval of NASA. Each sublicense shall make reference to the license, including the rights retained by the Government, and a copy of such sublicense shall be furnished to NASA.

(5) The license shall require the licensee to carry out the plan for development or marketing of the invention, or both, to bring the invention to practical application within a period specified in the license, and to continue to make the benefits of the invention reasonably accessible to the public.

(6) The license shall require the licensee to report periodically on the utilization or efforts at obtaining utilization that are being made by the licensee, with particular reference to the plan submitted.

(7) All licenses shall normally require royalties or other consideration.

(8) Where an agreement is obtained pursuant to § 1245.204(a)(2) that any products embodying the invention or produced through use of the invention will be manufactured substantially in the United States, the license shall recite such agreement.

(9) The license shall provide for the right of NASA to terminate the license, in whole or in part, if:

(i) NASA determines that the licensee is not executing the plan submitted with its request for a license and the licensee cannot otherwise demonstrate to the satisfaction of NASA that it has taken or can be expected to take within a reasonable time effective steps to achieve practical application of the invention;

(ii) NASA determines that such action is necessary to meet requirements for public use specified by Federal regulations issued after the date of the license and such requirements are not reasonably satisfied by the licensee;

(iii) The licensee has willfully made a false statement of or willfully omitted a material fact in the license application or in any report required by the license agreement; or

(iv) The licensee commits a substantial breach of a covenant or agreement contained in the license.

(10) The license may be modified or terminated, consistent with this subpart, upon mutual agreement of NASA and the licensee.

(11) Nothing relating to the grant of a license, nor the grant itself, shall be construed to confer upon any person any immunity from or defenses under the antitrust laws or from a charge of

patent misuse, and the acquisition and use of rights pursuant to this subpart shall not be immunized from the operation of state or Federal law by reason of the source of the grant.

Types of Licenses

§ 1245.205 Nonexclusive licenses.

(a) *Availability of licenses.* Nonexclusive licenses may be granted under NASA inventions without publication of availability or notice of a prospective license.

(b) *Conditions.* In addition to the provisions of § 1245.204, the nonexclusive license may also provide that, after termination of a period specified in the license agreement, NASA may restrict the license to the fields of use or geographic areas, or both, in which the licensee has brought the invention to practical application and continues to make the benefits of the invention reasonably accessible to the public. However, such restriction shall be made only in order to grant an exclusive or partially exclusive license in accordance with this subpart.

§ 1245.206 Exclusive and partially exclusive licenses.

(a) Domestic licenses.

(1) *Availability of licenses.* Exclusive or partially exclusive licenses may be granted on NASA inventions: (i) 3 months after notice of the invention's availability has been announced in the *Federal Register*; or (ii) without such notice where NASA determines that expeditious granting of such a license will best serve the interests of the Federal Government and the public; and (iii) in either situation, specified in (a)(1)(i) or (ii) of this section only if:

(A) Notice of a prospective license, identifying the invention and the prospective licensee, has been published in the *Federal Register*, providing opportunity for filing written objections within a 60-day period;

(B) After expiration of the period in § 1245.206(a)(1)(iii)(A) and consideration of any written objections received during the period, NASA has determined that:

(1) The interests of the Federal Government and the public will best be served by the proposed license, in view of the applicant's intentions, plans, and ability to bring the invention to practical application or otherwise promote the invention's utilization by the public;

(2) The desired practical application has not been achieved, or is not likely expeditiously to be achieved, under any nonexclusive license which has been granted, or which may be granted, on the invention;

(3) Exclusive or partially exclusive licensing is a reasonable and necessary incentive to call forth the investment of risk capital and expenditures to bring the invention to practical application or otherwise promote the invention's utilization by the public; and

(4) The proposed terms and scope of exclusivity are not greater than reasonably necessary to provide the incentive for bringing the invention to practical application or otherwise promote the invention's utilization by the public;

(C) NASA has not determined that the grant of such license will tend substantially to lessen competition or result in undue concentration in any section of the country in any line of commerce to which the technology to be licensed relates, or to create or maintain other situations inconsistent with the antitrust laws; and

(D) NASA has given first preference to any small business firms submitting plans that are determined by the agency to be within the capabilities of the firms and as equally likely, if executed, to bring the invention to practical application as any plans submitted by applicants that are not small business firms.

(2) *Conditions.* In addition to the provisions of § 1245.204, the following terms and conditions apply to domestic exclusive and partially exclusive licenses:

(i) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.

(ii) The license shall reserve to NASA the right to require the licensee to grant sublicenses to responsible applicants, on reasonable terms, when necessary to fulfill health or safety needs.

(iii) The license shall be subject to any licenses in force at the time of the grant of the exclusive or partially exclusive license.

(iv) The license may grant the licensee the right of enforcement of the licensed patent pursuant to the provisions of Chapter 29 of Title 35, United States Code, or other statutes, as determined appropriate in the public interest.

(b) Foreign licenses.

(1) *Availability of licenses.* Exclusive or partially exclusive licenses may be granted on a NASA invention covered by a foreign patent, patent application, or other form of protection, provided that:

(i) Notice of a prospective license,

PATENT LICENSING REGULATIONS

identifying the invention and prospective licensee, has been published in the Federal Register, providing opportunity for filing written objections within a 60-day period and following consideration of such objections;

(ii) NASA has considered whether the interests of the Federal Government or United States industry in foreign commerce will be enhanced; and

(iii) NASA has not determined that the grant of such license will tend substantially to lessen competition or result in undue concentration in any section of the United States in any line of commerce to which the technology to be licensed relates, or to create or maintain other situations inconsistent with antitrust laws.

(2) *Conditions.* In addition to the provisions of § 1245.204, the following terms and conditions apply to foreign exclusive and partially exclusive licenses:

(i) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.

(ii) The license shall be subject to any licenses in force at the time of the grant of the exclusive or partially exclusive license.

(iii) The license may grant the licensee the right to take any suitable and necessary actions to protect the licensed property, on behalf of the Federal Government.

(c) *Record of determinations.* NASA shall maintain a record of determinations to grant exclusive or partially exclusive licenses.

Procedures

§ 1245.207 Application for a license.

An application for a license should be addressed to the Patent Counsel at the NASA installation having responsibility for the invention and shall normally include:

(a) Identification of the invention for which the license is desired, including the patent application serial number or patent number, title, and date, if known;

(b) Identification of the type of license for which the application is submitted;

(c) Name and address of the person, company, or organization applying for the license and the citizenship or place of incorporation of the applicant;

(d) Name, address, and telephone number of representative of applicant to whom correspondence should be sent;

(e) Nature and type of applicant's

business, identifying products or services which the applicant has successfully commercialized, and approximate number of applicant's employees;

(f) Source of information concerning the availability of a license on the invention;

(g) A statement indicating whether applicant is a small business firm as defined in § 1245.202(c);

(h) A detailed description of applicant's plan for development or marketing of the invention, or both, which should include:

(1) A statement of the time, nature and amount of anticipated investment of capital and other resources which applicant believes will be required to bring the invention to practical application;

(2) A statement as to applicant's capability and intention to fulfill the plan, including information regarding manufacturing, marketing, financial, and technical resources;

(3) A statement of the fields of use for which applicant intends to practice the invention; and

(4) A statement of the geographic areas in which applicant intends to manufacture any products embodying the invention and geographic areas where applicant intends to use or sell the invention, or both;

(i) Identification of licenses previously granted to applicant under Federally owned inventions;

(j) A statement containing applicant's best knowledge of the extent to which the invention is being practiced by private industry or Government, or both, or is otherwise available commercially; and

(k) Any other information which applicant believes will support a determination to grant the license to applicant.

§ 1245.208 Processing applications.

(a) Applications for licenses will be initially reviewed by the Patent Counsel of the NASA installation having responsibility for the invention. The Patent Counsel shall make a preliminary recommendation to the Director of Licensing, NASA Headquarters, whether to: (1) grant the license as requested, (2) grant the license with modification after negotiation with the licensee, or (3) deny the license. The Director of Licensing shall review the preliminary recommendation of the Patent Counsel and make a final recommendation to the NASA Assistant General Counsel for Patent Matters. Such review and final recommendation may include, and be based on, any additional information obtained from applicant and other sources that the Patent Counsel and the

Director of Licensing deem relevant to the license requested. The determination to grant or deny the license shall be made by the Assistant General Counsel for Patent Matters based on the final recommendation of the Director of Licensing.

(b) When notice of a prospective exclusive or partially exclusive license is published in the Federal Register in accordance with § 1245.206(a)(1)(iii)(A) or § 1245.206(b)(1)(i), any written objections received in response thereto will be considered by the Director of Licensing in making the final recommendation to the Assistant General Counsel for Patent Matters.

(c) If the requested license, including any negotiated modifications, is denied by the Assistant General Counsel for Patent Matters, the applicant may request reconsideration by filing a written request for reconsideration within 30 days after receiving notice of denial. This 30-day period may be extended for good cause.

(d) In addition to, or in lieu of requesting reconsideration, the applicant may also appeal the denial of the license in accordance with § 1245.211.

§ 1245.209 Notice to Attorney General.

A copy of the notice provided for in §§ 1245.206(a)(1)(iii)(A), and 1245.206(b)(1)(i) will be sent to the Attorney General.

§ 1245.210 Modification and termination of licenses.

Before modifying or terminating a license, other than by mutual agreement, NASA shall furnish the licensee and any sublicensee of record a written notice of intention to modify or terminate the license, and the licensee and any sublicensee shall be allowed 30 days after such notice to remedy any breach of the license or show cause why the license should not be modified or terminated.

§ 1245.211 Appeals.

(a) The following parties may appeal to the NASA Administrator or designee any decision or determination concerning the grant, denial, interpretation, modification, or termination of a license:

(1) A person whose application for a license has been denied;

(2) A licensee whose license has been modified or terminated, in whole or in part; or

(3) A person who timely filed a written objection in response to the notice required by

§§ 1245.206(a)(1)(iii)(A) or

PATENT LICENSING REGULATIONS

1245.208(b)(1)(i) and who can demonstrate to the satisfaction of NASA that such person may be damaged by the Agency action.

(b) Written notice of appeal must be filed within 30 days (or such other time as may be authorized for good cause shown) after receiving notice of the adverse decision or determination; including, an adverse decision following the request for reconsideration under § 1245.208(c). The notice of appeal, along with all supporting documentation should be addressed to the Administrator, National Aeronautics and Space Administration, Washington, DC 20546. Should the appeal raise a genuine dispute over material facts, fact-finding will be conducted by the NASA Inventions and Contributions Board. The person filing the appeal shall be afforded an opportunity to be heard and to offer evidence in support of the appeal. The Chairperson of the Inventions and Contributions Board shall prepare written findings of fact and transmit them to the Administrator

or designee. The decision on the appeal shall be made by the NASA Administrator or designee. There is no further right of administrative appeal from the decision of the Administrator or designee.

§ 1245.212 Protection and administration of inventions.

NASA may take any suitable and necessary steps to protect and administer rights to NASA inventions, either directly or through contract.

§ 1245.213 Transfer of custody.

NASA having custody of certain Federally owned inventions may transfer custody and administration in whole or in part, to another Federal agency, of the right, title, or interest in any such invention.

§ 1245.214 Confidentiality of information.

Title 35, United States Code, section 209, provides that any plan submitted pursuant to § 1245.207(h) and any report required by § 1245.204(b)(6) may be treated by NASA as commercial and

financial information obtained from a person and privileged and confidential and not subject to disclosure under section 552 of Title 5 of the United States Code.

James M. Beggs,

Administrator.

October 15, 1981.

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NASA SP-7039(15) SEC 1	N79-10001 - N79-21993
NASA SP-7039(16) SEC 1	N79-21994 - N79-34158
NASA SP-7039(17) SEC 1	N80-10001 - N80-22254
NASA SP-7039(18) SEC 1	N80-22255 - N80-34339
NASA SP-7039(19) SEC 1	N81-10001 - N81-21997
NASA SP-7039(20) SEC 1	N81-21998 - N81-34139
NASA SP-7039(21) SEC 1	N82-10001 - N82-22140
NASA SP-7039(22) SEC 1	N82-22141 - N82-34341
NASA SP-7039(23) SEC 1	N83-10001 - N83-23266
NASA SP-7039(24) SEC 1	N83-23267 - N83-37053
NASA SP-7039(25) SEC 1	N84-10001 - N84-22526
NASA SP-7039(26) SEC 1	N84-22527 - N84-35284
NASA SP-7039(27) SEC 1	N85-10001 - N85-22341
NASA SP-7039(28) SEC 1	N85-22342 - N85-36162
NASA SP-7039(29) SEC 1	N86-10001 - N86-22536
NASA SP-7039(30) SEC 1	N86-22537 - N86-33262
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16. Abstract Abstracts are provided for 85 patents and patent applications entered into the NASA scientific and technical information system during the period January 1987 through June 1987. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application.					
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